U.S. Department of the Interior
Bureau of Land Management

Lander Field Office - Wyoming

Final Environmental Impact Statement
Sheep Mountain Uranium Project
2016




It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/WY/PL-16/012+1330

IN REPLY
REFER TO:

WYW168184
3809 (WYR050)

Dear Public Land User:

Enclosed is the Final Environmental Impact Statement (FEIS) for the Sheep Mountain Uranium Project in Fremont County, Wyoming. This EIS was prepared to analyze the potential impacts of a Plan of Operations submitted by Energy Fuels Resources (USA) Inc., a wholly owned subsidiary of Energy Fuels Inc., to develop mining claims. The Sheep Mountain Project Area (Project Area) is located near the geographic center of Wyoming and encompasses approximately 3,611 acres within the Crooks Gap/Green Mountain Mining District.

This FEIS analyzes three alternatives in detail: the No Action Alternative, the Proposed Action Alternative, and the BLM Mitigation Alternative. The BLM Mitigation Alternative is the BLM's preferred alternative. The FEIS also contains a discussion of other alternatives that were considered but eliminated from detailed analysis.

Under the Proposed Action, Energy Fuels would utilize conventional open-pit and underground mining methods to remove uranium. Uranium has been historically mined in the Project Area, beginning in the early 1950s. The Project would involve three principal phases: Construction, Operations, and Reclamation. Within the 3,611-acre Project Area, a maximum of 929 acres would be disturbed on the surface throughout the anticipated 20-year Project schedule. Surface disturbance would be reclaimed and facilities would be decommissioned following completion of the Project.

The BLM Mitigation Alternative consists of Energy Fuels' Project with modifications to reduce the environmental impact, meaning that in addition to Energy Fuels' applicant-committed mitigation measures, additional mitigation measures are recommended by the BLM to further lessen the environmental effects of the Project. Both the applicant-committed mitigation measures and the additional mitigation measures recommended by the BLM are listed in the FEIS.

Copies of the FEIS are available at the BLM Lander Field Office at the above address or at the following website:

http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/sheepmtn.html

This FEIS is not a decision document. The publication of the Notice of Availability (NOA) in the *Federal Register* for this FEIS initiates a 30-day waiting period. Following conclusion of that period, the BLM Authorized Officer will prepare and sign the Record of Decision (ROD) to disclose the BLM's final decision on Energy Fuels' Plan of Operations and any project Conditions of Approval (COA). Availability of the ROD will be announced through local media, the project mailing list, and posted on the project website.

The FEIS was prepared pursuant to the National Environmental Policy Act (NEPA), the Federal Land Management Policy Act (FLPMA), and other regulations and statutes. The BLM prepared the FEIS in consultation with cooperating agencies, taking into account public comments received to date. The Draft Environmental Impact Statement (DEIS) was published on January 16, 2015. A 45-day public comment period for the DEIS was held from January 16, 2015 to March 3, 2015. A summary of the written comments received during the public review period for the DEIS and responses to the comments are provided in Appendix 1-A to the FEIS.

If you wish to submit comments on this FEIS, we request that you make them as specific as possible, with references to page numbers and chapters of the document. Please refer to "Sheep Mountain Uranium Project Comments" in your correspondence. Written comments will be accepted by fax, email, or letter for 30 days following the publication of the Notice of Availability in the *Federal Register* by the U.S. Environmental Protection Agency. All substantive comments will be reviewed and responded to in the ROD. Please provide your comments to:

Bureau of Land Management
Attn: Tom Sunderland
1335 Main Street
Lander, WY 82520-0589
Email: blm_wy_sheep_mountain_eis@blm.gov

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you may ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. The BLM will not consider anonymous comments. Comments, including names and street addresses of respondents, will be available for public review at the BLM Lander Field Office from 7:45 a.m. to 4:30 p.m., Monday through Friday, excluding federal holidays. Comments may be published as part of the NEPA document and other related documents. All submissions from organizations or businesses will be made available for public inspection in their entirety.

For further information concerning the document, please contact Tom Sunderland at (307) 332-8400.

Sincerely,

Richard Vander Voet
Field Manager
Lander Field Office

Sheep Mountain Uranium Project
FINAL ENVIRONMENTAL IMPACT STATEMENT (EIS)

Project Name:	Sheep Mountain Uranium Project Environmental Impact Statement
Lead Agency:	U.S. Department of the Interior Bureau of Land Management Lander Field Office Wind River/Bighorn Basin District, Wyoming
Project Location:	Fremont County, Wyoming
Correspondence on this EIS:	Bureau of Land Management Lander Field Office Attn: Tom Sunderland 1335 Main Street Lander, WY 82520 Fax: 307-332-8444 Email: blm_wy_sheep_mountain_eis@blm.gov
Availability period: **:**	Within 30 days of the date of the Notice of Availability published in the Federal Register

ABSTRACT

Energy Fuels Resources (USA) Inc. (Energy Fuels), a wholly owned subsidiary of Energy Fuels Inc., proposes to mine uranium from existing mining claims within the 3,611-acre Sheep Mountain Project Area, located within Fremont County, Wyoming within the Crooks Gap-Green Mountain Mining District. Energy Fuels would utilize conventional open pit and underground mining methods to remove uranium. Uranium has been historically mined in the Project Area, beginning in the early 1950s. The Project would involve three principal phases: Construction, Operations, and Reclamation. Within the 3,611-acre Project Area, a maximum of 929 acres would be disturbed on the surface throughout the anticipated 20-year Project schedule. Surface disturbance would be reclaimed and facilities would be decommissioned following completion of the Project.

A description of the Approved Project will be provided in the Record of Decision. Three alternatives were analyzed in detail in this Final EIS: the Proposed Action Alternative, the BLM Mitigation Alternative, and the No Action Alternative. The BLM Mitigation Alternative is the BLM's Preferred Alternative. The Proposed Action Alternative consists of Energy Fuels' Project as detailed in the Plan of Operations submitted to the BLM. The BLM Mitigation Alternative consists of Energy Fuels' Project with modifications to reduce the environmental impact, meaning that in addition to Energy Fuels' applicant-committed mitigation measures, additional mitigation measures are recommended by the BLM to further lessen the environmental effects of the Project. Under the No Action Alternative, the BLM would deny Energy Fuels' Project as proposed. Because the Project is located within the active Wyoming Department of Environmental Quality Land Quality Division Permit to Mine 381C, Energy Fuels would continue with certain reclamation obligations under the No Action Alternative. The No Action Alternative is analyzed in order to satisfy the requirements under NEPA.

Although the Final EIS is not a formal comment period, written comments on the Final EIS will be accepted by the Lander Field Office of the BLM throughout a 30-day availability period beginning on the date the United States Environmental Protection Agency publishes a Notice of Availability for this Final EIS.

Responsible Official for Final EIS: Wind River/Bighorn Basin District Manager

Executive Summary

Titan Uranium USA Inc., a wholly owned subsidiary of Titan Uranium Inc., submitted a Plan of Operations to the Bureau of Land Management (BLM) Lander Field Office (LFO) for the Sheep Mountain Project (Project) in Fremont County, Wyoming on June 16, 2011. On February 29, 2012, Energy Fuels Inc. acquired Titan Uranium Inc. and all of its subsidiaries are now wholly-owned subsidiaries of Energy Fuels Resources (USA) Inc. (Energy Fuels). Energy Fuels will continue as the owner and operator of the Sheep Mountain Project. Energy Fuels submitted a revised Plan of Operations to the BLM on July 9, 2012 and August 27, 2013. In January 2014, Energy Fuels submitted a revision application to the Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD) Permit to Mine 381C which was approved in July 2015. The Permit was made available to the BLM to provide additional details and clarifications to the August 2013 Plan of Operations.

The Project is located 8 road miles south of Jeffrey City, Wyoming, in Fremont County, in an area extensively mined starting in the 1950s and known as the Crooks Gap-Green Mountain Mining District. Energy Fuels is considering preparing an application for a U.S. Nuclear Regulatory Commission (NRC) Source and Byproduct Materials License for the proposed Heap Leach and Ore Processing Facility.

Energy Fuels proposes to mine uranium from existing mining claims within the 3,611-acre (~5.6 square miles) Sheep Mountain Project Area. Energy Fuels would utilize conventional open pit and underground mining methods to remove uranium. The Project would involve three principal phases: Construction, Operations, and Reclamation. The Project Area includes ~2,316 acres of federal surface, 772 acres under state ownership, and 523 acres of fee lands. Approximately 2,838 acres of federal mineral estate is included in the Project Area. Off-site processing at the Sweetwater Mill would occur on private lands entirely owned by Kennecott. Within the 3,611-acre Project Area, a maximum of 929 acres would be disturbed on the surface throughout the anticipated 20-year Project schedule. Surface disturbance would be reclaimed and facilities would be decommissioned following completion of the Project.

Purpose and Need

The Purpose and Need poses the question: What is the BLM decision to be made in response to the Proposed Action? In this case, the BLM decision to be made is whether or not the mining and processing of uranium would result in undue or unnecessary degradation to public lands. The need for a BLM action are to respond to Energy Fuel's proposal and to evaluate potential impacts that would result from implementing future plans and applications related to this proposal. The BLM has the responsibility for the laws and regulations regarding the availability of all locatable minerals on federal lands, including uranium, as specified under General Mining Law of 1872 as amended (30 United States Code - USC. §§ 22-54 and §§ 611-615), the original public land authority in 43 U.S.C. §§ 2, 15, 1201 and 1457, Title 43 of the CFR in Groups 3700 and 3800, and the Federal Land Policy and Management Act (FLPMA) of 1976 (43 USC 1701 et seq.). Under these laws, the BLM has the obligation to allow and encourage claim holders to develop their claims subject to reasonable restrictions including the restriction that undue or unnecessary degradation may not occur; see 43 CFR § 3809.411(d)(3).

Public Participation and Scoping

The BLM conducted public and internal scoping to solicit input and identify environmental issues and concerns associated with the Project. The public scoping process was initiated on August 23, 2011, with the publication of a Notice of Intent (NOI) in the Federal Register. In addition to the NOI, the BLM mailed 39 Dear Interested Party letters on August 26, 2011, notifying the public about the Project, the intent to prepare an EIS, and information about the scoping meetings. On August 23, 2011, the BLM issued press releases announcing their intent to prepare an EIS with information about the upcoming public scoping meetings, which were held in Lander, Riverton, and Jeffrey City using an open house format. The scoping period closed October 11, 2011.

The BLM received a total of eight comment submittals (e.g., letter or comment form) containing 60 individual comments during the public scoping period. Information gained during scoping assisted the BLM in identifying the potential environmental issues, alternatives, and mitigation measures. The process also provided a mechanism for narrowing the scope of issues so that analysis in the EIS could be focused on areas of high interest and concern. A majority of the comments were related to cumulative impacts, mitigation and monitoring, and potential impacts to range resources, water resources, and wildlife resources. There were also concerns and questions about the National Environmental Policy Act (NEPA) process.

In response to Energy Fuels' modification of the Plan of Operations in August 2013, the BLM issued a press release on September 25, 2013 providing notice of the availability of the modification. The BLM accepted comments on the modification for 30 days ending October 24, 2013. No comments were received.

The BLM conducted internal scoping to compile a list of resources potentially present in the LFO area to be considered in this EIS. Based on this list and public scoping, the following resources are discussed and analyzed in Chapters 3.0, 4.0, and 5.0 of this document:

- Climate and Air Quality
- Geologic Resources
- Mineral Resources
- Soils
- Water (Surface, Groundwater, Water Rights and Water Use)
- Invasive, Non-Native Species
- Vegetation
- Wetlands and Riparian Zones
- Special Status Species
- Wildlife
- Wild Horse and Burros
- Cultural Resources
- Paleontological Resources
- Tribal and Native American Religious Concerns

- Socioeconomics
- Environmental Justice
- Transportation/Access
- Public Health and Safety
- Recreation
- Livestock Grazing

The BLM has determined that the Project is in conformance with the BLM management plans and policies and is consistent with other federal and local land management plans and policies. As allowed under 36 CFR 800.8, the BLM has used the public comment process under NEPA to comply with the public consultation requirements of Section 106 of the National Historic Preservation Act (NHPA).

Public Comment on the Draft EIS

The Draft Environmental Impact Statement (DEIS) was published on January 16, 2015. A 45-day public comment period for the DEIS was held from January 16, 2015 to March 2, 2015. A summary of the written comments received during the public review period for the DEIS and responses to the comments are provided in Appendix 1-A to the FEIS. The BLM prepared the FEIS in consultation with cooperating agencies, taking into account public comments received to date.

Proposed Action and Alternatives

Chapter 2.0 provides a description of the Project alternatives and alternatives that were considered but eliminated from further consideration. In developing the alternatives, the BLM followed guidance set forth in the BLM-NEPA Handbook (H-1790-1), which provides for the development of a range of reasonable alternatives. Based on this guidance, the BLM developed the following alternatives for analysis in this EIS.

- The Proposed Action Alternative describes the proposed development and activities during Construction, Operations, and Reclamation described by Energy Fuels in the Plan of Operations for both on-site processing and off-site processing.
- The BLM Mitigation Alternative, which is the BLM’s Preferred Alternative, consists of the Plan of Operations (the Proposed Action Alternative) with certain modifications of the Plan and additional mitigation measures with an emphasis on environmental resource conservation.
- The No Action Alternative assumes that approval of Energy Fuels’ Sheep Mountain Uranium Project is denied based on it causing undue and unnecessary degradation of resources managed by the BLM. Existing infrastructure would be removed as required by existing permits, which include reclamation bonds.

Proposed Action Alternative. The Proposed Action would require 929.0 acres of disturbance of which 356.5 acres would be new disturbance and 572.5 acres were previously disturbed. Most of the new disturbance would be associated with the Congo Pit, the On-Site Ore Processing Facility, and the Hanks Draw Spoils Facility. Energy Fuels would utilize conventional open pit and underground mining methods to remove uranium. The Project would involve three principal phases: Construction, Operations, and Reclamation.

The Construction phase of the Project would include the installation of various roads, buildings, utilities, and infrastructure. Prior to the start of Operations, access roads and utilities would be installed. Mine support facilities such as an administrative office, shop, warehouse, and guard house for the Congo Pit, would be constructed before mining could occur. The Ore Pad and conveyor system would be constructed near the entry point to the new proposed double entry decline to the Sheep Underground Mine. Construction of the double entry decline would be deferred up to 5 years after the start of the Congo Pit. The On-Site Ore Processing Facility consisting of a 40-acre Heap Leach Pad, Treatment Ponds, and Extraction Plant, and Processing and Packaging Plant would be constructed in the southwest corner of the Project Area.

The Operations phase of the Proposed Action would consist of mining uranium using conventional open pit (Congo Pit) and underground (Sheep Underground) methods. In addition to developing the Congo Pit for recovery of shallow ore reserves, Energy Fuels would rehabilitate and further develop the Sheep Underground Mine to be constructed for the recovery of deeper ore reserves. Ore from the Congo Pit and Sheep Underground mines would be transported via overland conveyor to the On-Site Ore Processing Facility and processed to produce uranium oxide (yellowcake) and/or transported for off-site processing at the Sweetwater Mill.

Reclamation would include: completing the backfill of the Congo Pit with overburden and spoils; plugging and abandoning ventilation shafts and access tunnels; decommissioning and demolishing the facilities and buildings; removing ponds and buried process piping from the processing facility; re-grading the surface to approximate original contours; replacement of topsoil; and revegetating the disturbed surface with a native plant species approved by the BLM and WDEQ-LQD. The reclamation plan is intended to return the lands disturbed by the Project to approximate original contours and re-establish pre-mine drainage patterns and densities. Because of the historic disturbance at this location, establishing pre-historic mining contours and conditions on all disturbed land would be difficult to achieve. However, with implementation of the reclamation plan, previously disturbed areas would be reclaimed into a safer, more natural environment by establishing through-flowing drainages, vegetation, and natural contours.

Based on currently identified resources, the Congo Pit would operate for approximately 8 years, and the Sheep Underground Mine would have a mine life of approximately 11 years. Ore processing would continue for a number of years after the mines are closed. Reclamation of the mines and associated facilities would commence immediately after mine closure, and reclamation of the On-Site Ore Processing Facility would commence as soon as processing is completed. The overall Project life is anticipated to be 20 years from initial construction to completions of final reclamation activities. The Project schedule is not anticipated to change due to off-site processing.

BLM Mitigation Alternative (Preferred Alternative). This alternative was developed in response to public and agency inputs collected during the scoping process in order to potentially reduce the environmental impacts of the Project. This alternative is similar to the Proposed Action Alternative, in that conventional mining techniques would be utilized and uranium would be produced using heap leach and solvent extraction/ion exchange procedures. This alternative would utilize the same processes and take place over the same time period as the Proposed Action but with changes and mitigation procedures implemented to reduce and/or otherwise offset surface disturbance and potentially limit impacts to human health, safety, and the environment. Changes to the Proposed Action under this alternative would include: revisions to Energy Fuels' reclamation plan, and additional mitigation measures to protect soils, vegetation, wildlife, cultural, socioeconomic, transportation, and recreation resources.

No Action Alternative. Under this Alternative, the BLM would deny Energy Fuels' Plan of Operations as proposed. Therefore, the BLM would be denying the proponent's right to extract minerals on federal lands from their mining claims. The selection of the No Action Alternative may constitute a taking because it violates valid existing rights under the U.S. Mining laws and results in legal action by the proponent. The No Action Alternative is described in this document in order to satisfy the requirements under NEPA.

Energy Fuels is obligated to complete certain reclamation efforts under the existing WDEQ-LQD Permit to Mine 381C that would occur under any alternative including the No Action Alternative. Of the total 891.7 acres of reclaimed disturbance, 215.9 acres were reclaimed by the Wyoming Abandoned Mine Lands (AML) program and 675.8 acres were reclaimed by others. Approximately 420 acres are currently disturbed. Of this, 144 acres are currently bonded for reclamation under WDEQ-LQD Permit to Mine 381C and 190 acres were disturbed prior to existing mining and reclamation laws for which Energy Fuels has no reclamation obligation. The current mine reclamation commitments that would occur under the No Action Alternative include:

- Sheep Declines. The Big Sheep and Little Sheep unfinished declines would be removed. Spoil facilities would be removed and the area around the declines would be re-graded and seeded. The declines would be sealed by installing a permanent concrete bulkhead backfilled to the surface.
- Access roads. The main road to the Sheep Declines Shop and McIntosh Pit up to the Sheep II Shaft would be reclaimed. Additionally, the Hanks Draw Road up to the Sheep I Shaft would be reclaimed.
- Sheep I and II Shafts. Energy Fuels has placed a permanent surface cap over both the Sheep I and Sheep II shafts that allows for monitoring, ventilation, and dewatering. The Sheep II Shaft area has been reclaimed to the standards consistent for mining, but additional work would be done under the No Action Alternative (final regrading and seeding). Sheep I spoils would be removed and the site reclaimed.
- The McIntosh Pit and Shops. In 2011, the mine shops were demolished, all material removed, and the solid waste facility was excavated and removed. Sellable scrap metal was salvaged and all other solid waste was properly disposed of off-site at the Fremont County facility.

WDEQ-AML began work on the McIntosh Pit in 2014 (WDEQ-AML Project 16-O), and expects to complete work by 2020. Originally, Energy Fuels had a reclamation obligation for 105 acres under WDEQ-LQD Permit to Mine 381C to reduce a portion of the pit highwalls. For more efficient coordination of the work, Energy Fuels' bond obligation for this work was addressed through a cooperative agreement between WDEQ-AML, Energy Fuels, and WDEQ-LQD.

Alternatives Considered but Eliminated from Detailed Analysis: The BLM considered the following alternatives that were eliminated from detailed impact analysis in this EIS:

- In-situ recovery (ISR) mining was not analyzed in detail because there are extensive historical underground and reclaimed open pit workings in the Project Area, and application of ISR methods would not be practical technically or consistent with State of Wyoming requirements.
- Locating the on-site processing facility at the Paydirt Pit was not analyzed in detail due to more rugged topography and because the proposed location overlaps more previously disturbed lands.
- Conventional on-site milling would require additional capital costs and increase operating costs due to increased labor and power requirements to operate the crushing, leaching, and counter current decantation (CCD) circuits. Because of the relative close location of an existing and fully permitted conventional mill (the Sweetwater Mill), Energy Fuels did not wish to pursue constructing an entirely new mill to complete the same milling activities that could occur at the Sweetwater Mill.
- Ablation is a new technique that separates uranium-bearing minerals from its host rock using high pressure water nozzles. This technique has not undergone enough testing to fully understand the associated impacts or cost effectiveness. Due to the limited data available, ablation is not analyzed as an alternative in this EIS.
- Deep well injection was not analyzed in detail as a management method for liquid waste because the focus is on liquid process wastes potentially containing licensed material. Both evaporation and deep well injection disposal methods require the use of holding ponds or storage tanks prior to disposal and both methods are assumed to be equally durable and protective. There is minimal incremental benefit between the evaporative/heap disposal method and deep well injection.
- Alternate access routes to the Sweetwater Mill were not analyzed in detail because the routes were much longer that the proposed route, because they would require travel on US Highway 287 with a higher possibility for human contact and collisions, and because they provided no overall benefits to greater sage-grouse over the proposed route.
- The use of ablation techniques that separate uranium-bearing minerals from its host rock using high pressure water nozzles was not analyzed in detail due to limited available data.

- Deep well injection of liquid process wastes generated on-site was not analyzed in detail due to the additional requirement (and associated cost) of injection wells and because there is minimal incremental benefit between the evaporative/heap disposal method and deep well injection..
- The alternative of a tailings disposal cell in the Congo Pit was not analyzed in detail because this alternative would result in less potential groundwater protection in the event of future liner failure.
- Disposal of excess water from dewatering into the Sheep Underground Mine workings was considered as an alternative to treatment and surface disposal of the water. Groundwater modeling indicated such injection would result in increased groundwater inflow rates into the Congo Pit, negating the efforts to dewater the pit. Therefore, this alternative was eliminated from further consideration.

Affected Environment

Chapter 3.0 of the EIS describes the affected environment of the Sheep Mountain Project Area for each of the resources identified during internal scoping and listed above. These resources are present within the Project Area and provide the basis to address substantive issues of concern brought forward during internal and public scoping. The information presented in Chapter 3.0 provides quantitative data and spatial information where appropriate to the resource that serves as a baseline for comparison of the direct, indirect, and cumulative impacts of each of the alternatives.

Environmental Consequences

Chapter 4.0 of the EIS describes the environmental effects of implementing the alternatives on the affected environment as described in Chapter 3.0. The chapter is divided into subsections addressing the specific incremental impacts for each of the resources identified during internal scoping listed above. The resource-specific effects of the alternatives are evaluated quantitatively and qualitatively, as appropriate, based on available data and the nature of the resource analyzed. A comparison of the mitigation measures and a comparison of the impacts associated with the three alternatives are provided in Tables 2.4-1 and 2.7-1 of the EIS.

Cumulative Impacts

Cumulative impacts from past, present, and reasonably foreseeable future actions are presented in Chapter 5.0. For each resource, the Cumulative Impact Analysis Area (CIAA) was developed appropriate to the geographical extent of anticipated cumulative impacts. For some resources (e.g., paleontology, soils, and vegetation), the CIAA is the same as the Project Area. For other resources (e.g., socioeconomics and air quality), the CIAA includes a larger area within which cumulative impacts could occur.

Projects considered in the cumulative impact analysis include the following:

- Past disturbance associated with historic uranium mining activities;
- Existing disturbance from on-going projects associated with mineral exploration, mining, reclamation of historic mining activity under the Wyoming AML program,

oil and gas development, and long-term management of uranium tailings under the U.S. Department of Energy (DOE) Legacy Management program; and

- Future disturbance from proposed project activities associated with mineral exploration, oil and gas development, wind energy projects, and reclamation of historic mining activity under the Wyoming AML program.

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List of Abbreviations and Acronyms

ΔANC	change in acid neutralizing capacity
Δdv	delta-deciviews
μg/m^3	micrograms per cubic meter
μg/l	micrograms per liter
μmhos/cm	micromhos per centimeter
μR/hr	microRoentgens per hour
AADT	Annual Average Daily Traffic
ACECs	Areas of Critical Environmental Concern
ACS	American Community Survey
AEA	Atomic Energy Act
ALARA	as low as (is) reasonably achievable
AM	air monitor
AML	Abandoned Mine Lands
amsl	above mean sea level
ANC	acid neutralizing capacity
ANFO	ammonium nitrate and fuel oil
AO	Authorized Officer
APD	Application for Permit to Drill
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
AQD	Air Quality Division
AQRVs	Air Quality Related Values
AQTSD	Air Quality Technical Support Document
AR5	Fifth Assessment Report
ARI	aquatic resources inventory

ARMPA	Approved Resource Management Plan Amendment
ATVs	all-terrain vehicles
AUM	animal unit month
BBS	Breeding Bird Survey
BCC	Birds of Conservation Concern
BCR	Bird Conservation Regions
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act
BKS	BKS Environmental Associates, Inc.
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMPs	Best Management Practices
BRS	BRS Engineering
BSCs	Biological Soil Crusts
$CaCO_3$	calcium carbonate
CAMx	Comprehensive Air Quality Model with Extensions
CASTNET	Clean Air Status and Trends Network
CCD	Census County Division
CD-C	Continental Divide-Creston
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
CIAAs	cumulative impact analysis areas
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
C_r	concentration ratios
CR	County Road
CY	cubic yards
DATs	deposition analysis thresholds
dBA	decibel
DOE	United States Department of Energy
DOI	United States Department of the Interior
dv	deciview
DVC	base case or current year
DVF	future year
EC	electrical conductivity
EIS	Environmental Impact Statement
EMT	emergency medical technician
Energy Fuels	Energy Fuels Resources (USA) Inc.
EO	Executive Order
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know
ESA	Endangered Species Act
ESD	Ecological Site Description
^oF	degrees fahrenheit
FAR-D	Functional at Risk and in a downward trend
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FLAG	Federal Land Managers' Air Quality Related Values Work Group
FLMs	Federal Land Managers
FLPMA	Federal Land Policy and Management Act

FR	Federal Register
ft/yr	feet per year
ft^2/day	square feet per day
FWS	United States Fish and Wildlife Service
GCL	geosynthetic clay liner
GHGs	greenhouse gases
GHMAs	General Habitat Management Areas
GHS	Global Harmonized System
GMCA	Green Mountain Common Allotment
gpd	gallons per day
gpm	gallons per minute
GWP	global warming potential
H	Horizontal
H_2O_2	hydrogen peroxide
H_2SO_4	sulfuric acid
HA	hunt area
HAPs	hazardous air pollutants
HDPE	high density polyethylene
HMAs	herd management areas
HNO_3	nitric acid
HUD	U.S. Department of Housing and Urban Development
IM	Instruction Memorandum
IMPROVE	Interagency Monitoring of Protected Visual Environments
IPCC	Intergovernmental Panel on Climate Change
IPEOC	International Petroleum and Exploration Operating Corporation
ISL	in-situ leaching
ISR	in-situ recovery
IX	ion exchange
JCVFD	Jeffrey City Volunteer Fire Department
K	potassium
Kennecott	Kennecott Uranium Company
kg/ha-yr	kilograms per hectare per year
km	kilometers
kV	kilovolts
LCI	Lost Creek ISR, LLC
LFO	Lander Field Office
LHDs	load, haul, and dump
Lidstone	Lidstone and Associates, Inc.
Lidstone and Wright	Lidstone and Wright Environmental Services
LM	Legacy Management
LQD	Land Quality Division
LRMP	Lander Resource Management Plan
LRP	Limited Reclamation Potential
LTA	LTA, Inc.
LVFD	Lander Volunteer Fire Department
MATS	Modeled Attainment Test Software
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
mgd	million gallons per day
mg/l	milligrams per liter
MLRA	Major Land Resource Area
mmhos/cm	micromhos per centimeter
MMIF	Mesoscale Model Interface Program
MMPA	Mining and Mineral Policy Act
MOU	Memorandum of Understanding
MPB	mountain pine beetle

mph	miles per hour
mrem	millirem
m/s^2	meters per square second
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration
N	nitrogen
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
$NaClO_3$	sodium chlorate
NADP	National Acid Deposition Program
NASA	National Aeronautics and Space Administration
NCA	U.S. National Climate Assessment
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NH_4	ammonium
NHPA	National Historic Preservation Act
NHTs	National Historic Trails
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide
NO_3	nitrate
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NORM	Naturally Occurring Radiological Materials
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NR	Not Reported
NRC	United States Nuclear Regulatory Commission
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSS	Native Special Status
NTMC	National Trail Management Corridor
NTN	National Trends Network
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory
O_3	ozone
OHV	off-highway vehicle
OSHA	Occupational Health and Safety Administration
P	phosphorus
PAR	Pesticide Application Records
PAWMA	Popo Agie Weed Management Area
Pb	lead
pCi/g	picocuries per gram
pCi/l	picocuries per liter
PCW	Power Company of Wyoming
PDO	property damage only
PFC	Proper Functioning Condition
PFYC	Potential Fossil Yield Classification
PGA	peak ground acceleration
PGM	photochemical grid model
PHMAs	Priority Habitat Management Areas
PILT	payment in lieu of taxes
PLS	Pregnant Leach Solution
$PM_{2.5}$	particulate matter greater than 2.5 microns in effective diameter
PM_{10}	particulate matter greater than 10 microns in effective diameter
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation

ppb	parts per billion
PPE	Personal Protective Equipment
ppm	parts per million
Project	Sheep Mountain Uranium Project
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
PUBh	Palustrine Unconsolidated Bottom
PUP	Pesticide Use Proposal
PUR	Pesticide Use Report
PWS	Public Water Source
RCRA	Resource Conservation and Recovery Act
Real West	Real West Natural Resource Consulting
rem	roentgen equivalent man
RFD	reasonably foreseeable development
RFFAs	reasonably foreseeable future actions
RFO	Rawlins Field Office
RHR	Regional Haze Rule
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RPA	Roscoe-Postle Associates, Inc.
RV	recreational vehicle
RVFD	Riverton Volunteer Fire Department
S	sulfur
SARs	sodium adsorption ratios
SARA	Superfund Amendment and Reauthorization Act
SFAs	Sagebrush Focal Areas
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SMCLs	secondary maximum contaminant levels
SO_2	sulfur dioxide
SO_4	sulfate
SOC	Species of Concern
SOPs	Standard Operating Procedures
SOR	secondary oil recovery
SR	Stratigraphic rex, LLC
SUGMA	Small and Upland Game Management Areas
SVR	Standard Visual Range
SWAP	Source Water Assessment Program
SWPPP	Stormwater Pollution Prevention Plan
SX	solvent extraction
TDS	Total Dissolved Solids
TEDE	total effective dose equivalent
TENORM	Technically Enhanced Radiological Materials
tg/y	teragrams per year
Titan	Titan Uranium USA Inc.
TMDL	Total Maximum Daily Loads
tpy	tons per year
TSS	total suspended solids
U_3O_8	uranium oxide
UBC	Uniform Building Code
UIC	Underground Injection Control
UMTRCA	Uranium Mill Tailings Radiation Control Act
UPC	Uranium Power Corp.
USACE	U.S. Army Corps of Engineers
USC	United States Code

USCEAR	United Nations Committee on the Effects of Atomic Radiation
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USECC	U.S. Energy-Crested Corp.
USGS	United States Geological Survey
V	Vertical
VIEWS	Visibility Information Exchange Web System
VOCs	volatile organic compounds
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WAQSR	Wyoming Air Quality Standards and Regulations
WDAI	Wyoming Department of Administration and Information
WDEQ	Wyoming Department of Environmental Quality
WDWS	Wyoming Department of Workforce Services
Western Nuclear	Western Nuclear, Inc.
WestJumpAQMS	West-wide Jump Start Air Quality Modeling Study
WGFD	Wyoming Game and Fish Department
WHDP	Wyoming Housing Database Partnership
WMA	Waterfowl Management Area
WNV	West Nile Virus
WOGCC	Wyoming Oil and Gas Conservation Commission
WOSLI	Wyoming Office of State Lands and Investments
WPBR	white pine blister rust
WPCD	Fremont County Weed and Pest Control District
WQD	Water Quality Division
WRAP	Western Regional Air Partnership
WRCC	Western Regional Climate Center
WRF	Weather Research and Forecasting
WSAs	Wilderness Study Areas
WSEO	Wyoming State Engineer’s Office
WYDOT	Wyoming Department of Transportation
WYNDD	Wyoming Natural Diversity Database
WYPDES	Wyoming Pollutant Discharge Elimination System
WY	Wyoming

CHAPTER 1.0
INTRODUCTION AND BACKGROUND

1.1 PROJECT LOCATION AND BACKGROUND

On February 29, 2012, Energy Fuels Inc. acquired the Sheep Mountain Uranium Project (Project) in Wyoming through its acquisition of Titan Uranium USA, Inc. (Titan) and is redeveloping the Project under management of its wholly-owned subsidiary, Energy Fuels Resources (USA) Inc. (Energy Fuels). Energy Fuels will continue as the owner and operator of the Project.

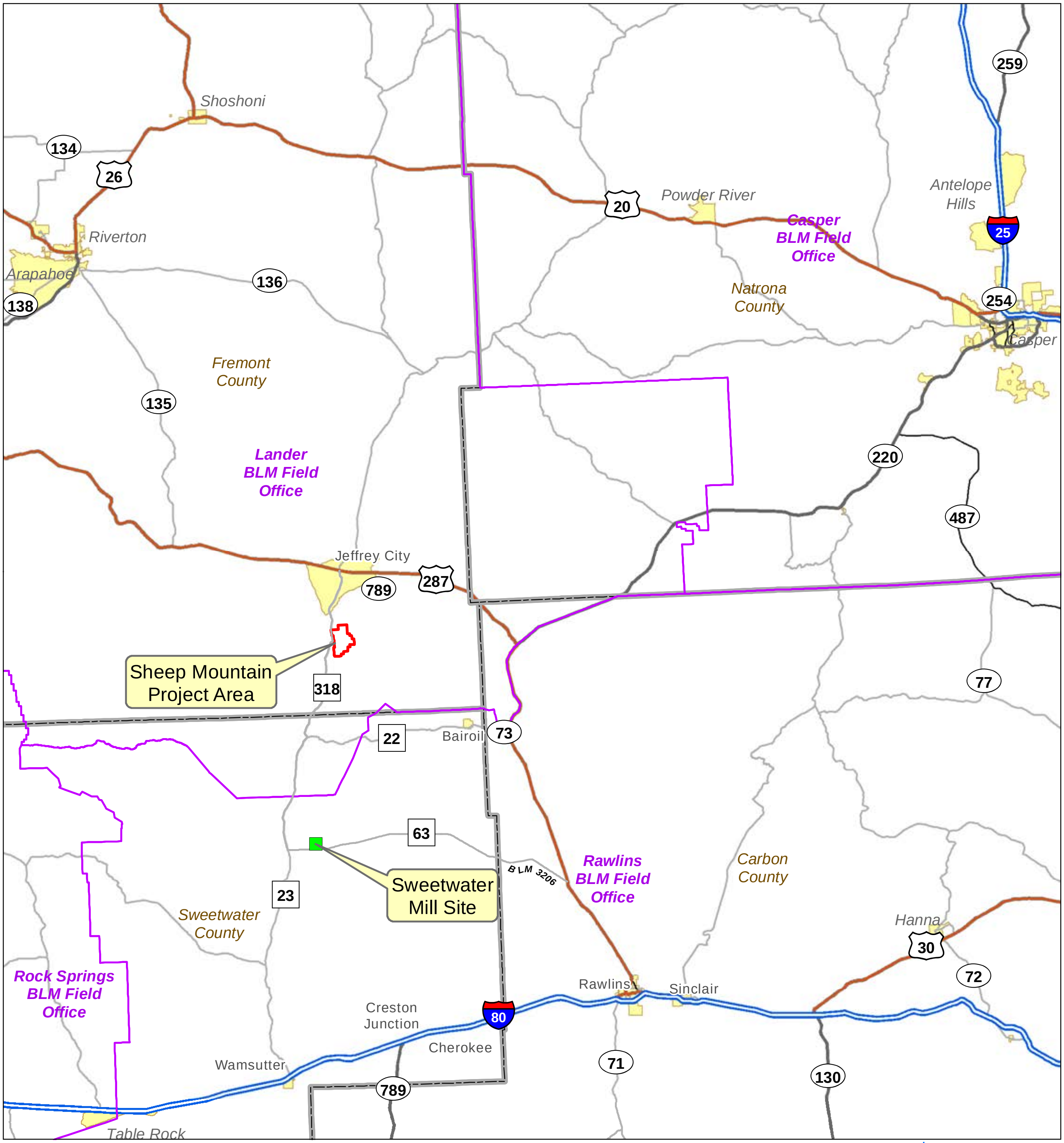
Titan submitted a Plan of Operations for the Project, per the requirements of 43 Code of Federal Regulations (CFR) § 3809.400 et seq., to the Bureau of Land Management (BLM) Lander Field Office (LFO) on June 16, 2011. Energy Fuels submitted a revised Plans of Operations to the BLM on July 9, 2012, on August 27, 2013, and on October 6, 2015 (Energy Fuels, 2015a). The Project is also within active State of Wyoming Permit to Mine 381C, which was originally issued in 1975 and is administered by the Wyoming Department of Environmental Quality-Land Quality Division (WDEQ-LQD). In January 2014, Energy Fuels submitted a revision to the WDEQ-LQD Permit to Mine 381C and the revision was made available to the BLM to provide additional details and clarifications to the August 2013 Plan of Operations. Energy Fuels will submit an application to the United States Nuclear Regulatory Commission (NRC) for a Source and Byproduct Materials License for the proposed Heap Leach and Ore Processing Facility if this path is selected for project advancement.

The Project is located 8 road miles south of Jeffrey City, Wyoming, in Fremont County, 6th Principal Meridian, Township 28 North, Range 92 West, Sections 16, 17, 20, 21, 22, 27, 28, 29, 32, and 33 in an area previously extensively mined starting in the 1950s. This area lies approximately 62 road miles southeast of Riverton, 67 road miles north of Rawlins, and 105 road miles southwest of Casper, in the Crooks Gap Mining District (see Map 1.1-1).

1.2 PURPOSE AND NEED

The National Environmental Policy Act (NEPA) is the process by which the BLM identifies alternatives to a proposed action and analyzes the environmental impacts to inform the public and the decision maker. NEPA includes a requirement to present the Purpose and Need for a proposed project which serves as the basis for developing a reasonable range of alternatives. The purpose of the proposed Project is to determine whether the mining and processing of uranium from existing mining claims would result in undue or unnecessary degradation to public lands.

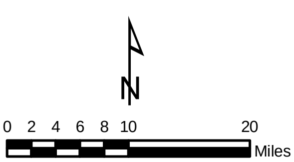
The need for a BLM action is to respond to Energy Fuels' proposal and to evaluate potential impacts that would result from implementing future plans and applications related to the proposal. The BLM has the responsibility for the laws and regulations regarding the availability of all locatable minerals on federal lands, including uranium, as specified under General Mining Law of 1872 as amended (30 United States Code - USC §§ 22-54 and §§ 611-615), the original public land authority in 43 USC §§ 2, 15, 1201 and 1457, Title 43 of the CFR in Groups 3700 and 3800, and the Federal Land Policy and Management Act (FLPMA) of 1976 (43 USC § 1701 et seq.). Under these laws, the BLM has the obligation to allow and encourage claim holders to develop their claims subject to reasonable restrictions including the restriction that undue or unnecessary degradation may not occur; see 43 CFR § 3809.411(d)(3).



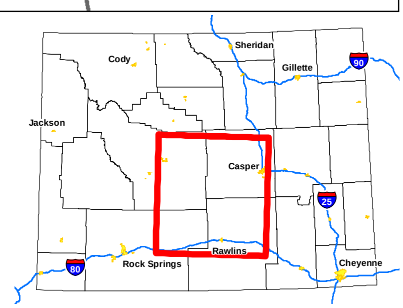
Map 1.1-1
General Project Location

Legend

- Project Area Boundary
- Sweetwater Mill Site
- US Census Populated Places (areas)
- Wyoming BLM Field Office Boundary
- County



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM



More specifically, the decisions to be made by the BLM Authorized Officer (AO) are:

1. Whether Energy Fuels' Plan of Operations as submitted will ensure the proposed Project will not cause "unnecessary or undue degradation" to public lands managed by the BLM (43 CFR § 3809 revised 2001);
2. Whether to approve Energy Fuels' Plan of Operations with changes or conditions necessary to prevent undue or unnecessary degradation to public lands, and to meet the standards of 43 CFR § 3809.420; and
3. The BLM will make a determination as to whether or not the construction, presence, or maintenance of the temporary or permanent structures described in the Plan of Operations meet the requirements of the 43 CFR § 3715 regulations."

1.3 LEGAL AND POLICY CONSIDERATIONS

1.3.1 Conformance with Federal Management Plans and Policies

The BLM has the responsibility and authority to manage the publically held surface and subsurface resources located within the jurisdiction of the LFO. Policies for development and land use decisions for federal lands and minerals for the Project are contained in the following federal documents:

- Record of Decision (ROD) for the Lander Resource Management Plan (LRMP) (BLM, 2014a) and the range of alternatives described in the Final Environmental Impact Statement (FEIS) and Resource Management Plan (RMP) revision (BLM, 2013a);
- General Mining Law of 1872, as amended (30 USC §§ 22-54 and §§ 611-615);
- Title 43 CFR §§ 3700 and 3800; and
- Federal Land Policy Management Act of 1976.

Additional information and guidance for the Project is contained in the following documents:

- Plan of Operations Sheep Mountain Uranium Project (Energy Fuels, 2015a);
- WDEQ-LQD Permit to Mine 381C;
- 10 CFR § 71 (NRC) and 49 CFR § 173.389 (United States Department of Transportation - USDOT). Transportation of radioactive material in accordance with NRC regulation, and transport of all byproduct material for off-site disposal in accordance with USDOT in addition to NRC regulations;
- State of Wyoming Executive Order (EO) 2015-4 Greater Sage-Grouse Core Area Protection (State of Wyoming, 2015) and;
- 10 CFR § 40.28 Uranium Mill Tailings Radiation Control Act (UMTRCA) Title II disposal sites managed by the Office of Legacy Management (LM).

Management objectives within the LRMP include allowing locatable mineral exploration and development while protecting or mitigating impacts to other resource values. Thus, the proposed Project is consistent with the management decisions contained in the LRMP as well as the associated FEIS (BLM, 2013a) and ROD (BLM, 2014a).

The NRC, established under the Energy Reorganization Act of 1974 and Atomic Energy Act of 1954 (AEA), as amended by UMTRCA, is authorized to issue licenses for the possession and use of source material and byproduct material. These statutes require that the NRC ensure source material, as defined in AEA Section 11(z) and byproduct material, as defined in AEA Section 11e(2) is managed to conform with applicable regulatory requirements. Uranium recovery is regulated by the NRC pursuant to the requirements of Part 40 of Title 10 of the CFR (10 CFR § 40), "Domestic Licensing of Source Material" and more specifically Appendix A to

Part 40, “Criteria Relating to the Operation of Uranium Mills and the Disposition of Tailings or Wastes Produced by the Extraction or Concentration of Source Material from Ores Processed Primarily for Their Source Material Content.” Energy Fuels must obtain approval from the NRC to conduct uranium recovery at Sheep Mountain.

The BLM will be a Cooperating Agency in the development of the NRC Environmental Impact Statement (EIS) of Energy Fuels’ application, should the application be submitted. The BLM is separately charged with preventing undue and unnecessary degradation of federal surface through the development and decisions made within this EIS.

1.3.2 Conformance with Local Land Management Plans and Policies

The State of Wyoming is a Cooperating Agency on this EIS. There are no comprehensive State of Wyoming plans for the Sheep Mountain area. Through the Office of the Governor, protections associated with Project components that fall under the jurisdiction of individual state agencies have been identified and included in alternatives discussed in this document.

The proposed Project is located in Fremont County which has developed the Fremont County Wyoming Land Use Plan (Fremont County, 2004a). It is “intended to be a guide for the citizens of Fremont County in identifying and respecting the customs, culture, economic viability, social stability, and quality of life found in this unique area, and then applying those values to growth and development as they occur in the County.” The Fremont County plan recognizes the influence the mineral industry has on area values, and includes provisions for encouraging and supporting economically feasible mineral development. As a Cooperating Agency, Fremont County has been involved in the development of Project alternatives described in this document. Because the Project would both supply income from royalties/taxes and meet Fremont County concerns, the proposed Project is consistent with Fremont County planning objectives.

Sweetwater County is also a Cooperating Agency. The Sweetwater County 2002 Comprehensive Plan calls for industrial development to occur in a manner that balances economic growth with environmental protections. Because the existing Sweetwater Mill is zoned for Mineral Development, the potential use of the mill for this Project is consistent with the Sweetwater County Comprehensive Plan. Sweetwater County encourages consideration of the following conditions:

- County permits, and county road licenses are obtained;
- A Sweetwater County Road Use, Improvement and Maintenance Agreement is approved and implemented; and
- Project concerns are addressed with the communities of Bairoil and Wamsutter and with the Sweetwater County Solid Waste District #2 as well as the High Desert Rural Health Care District.

If off-site processing occurs and commercial hauling becomes necessary on the Minerals Exploration Road in Carbon County, a permit from the BLM Rawlins Office may be necessary.

1.3.3 Authorizing Actions and Project Relationships to Statutes and Regulations

BLM authority for land management derives from the FLPMA. General BLM regulations are described in 43 CFR, Subtitle B - Regulations Relating to Public Lands, Chapter II - BLM, United States Department of the Interior (DOI). BLM regulations for the management of mining included in 43 CFR § 3809, Surface Management, were promulgated in 1981, revised in 2001, and derive their mandate from Sections 302 and 303 of the FLPMA. Subpart 3809 establishes procedures and standards for mining claimants to prevent public land degradation and requires reclamation of disturbed areas. It also requires coordination with state agencies. Under 43 CFR 3809 regulations, surface activity for the proposed Project is more than casual use (includes use of mechanized equipment), disturbs greater than 5 acres of public land and therefore requires a Plan of Operations, a full environmental assessment, and reclamation bonding.

The General Mining Law of 1872 declared all valuable mineral deposits in land belonging to the United States to be free and open to exploration and purchase. Under the FLPMA, these actions require recordation of mining claims with the BLM and authorized regulations for surface protection of the public lands. The Mining and Mineral Policy Act of 1970 (MMPA) mandates that federal agencies ensure that closure and reclamation of mine operations be completed in an environmentally responsible manner. The MMPA states that the federal government should promote the “development of methods for the disposal, control, and reclamation of mineral waste products, and the reclamation of mined lands, so as to lessen any adverse impact of mineral extraction and processing upon the physical environment that may result from mining mineral activities.”

The management of use and occupancy of public lands for the development of locatable minerals is described in the provisions of 43 CFR § 3715. The BLM will make a determination as to whether or not the construction, presence, or maintenance of the temporary or permanent structures described in the Plan of Operations meet the requirements of the 43 CFR § 3715 regulations.

Other major federal, state, and local laws, regulations and applicable permits that are relevant to the proposed Project include those listed in Table 1.3-1, which is not all-inclusive.

Table 1.3-1
Major Federal, State, and Local Laws, Regulations, and Applicable Permits

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
Federal Agencies		
BLM	BLM will prepare an EIS to review the environmental impacts associated with the Plan of Operations, determine if changes need to be made to the Plan of Operations, and issue a ROD	NEPA (Public Law 91-190) and Council on Environmental Quality (CEQ) - Regulations for Implementing NEPA (40 CFR §§ 1500 – 1508)
	BLM to authorize mining operations based on submitted Plan of Operations	General Mining Law of 1872, as amended (30 USC §§ 22-54 and §§ 611-615), and implementing regulations (43 CFR §§ 3700 and 3800)
		Portions of the FLPMA of 1976 43 USC §§ 1701-1782, as amended that affect the General Mining Law
	Antiquities and cultural resource permits on BLM-administered land	Antiquities Act of 1906, as amended (16 USC §§ 431-433) Archaeological Resources Protection Act of 1979, as amended (16 USC §§ 470aa-47011) Preservation of American Antiquities, as amended (43 CFR § 3) National Historic Preservation Act (NHPA), as amended (16 USC § 470)(36 CFR § 80)
	Evaluate Environmental Justice	Executive Order 12898, “Environmental Justice” February 11, 1994
	Pesticide Use Permit and Daily Pesticide Application Record	BLM Authorization for Herbicide Applications on Federal Lands

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
	Federal Noxious Weed Act compliance	Plant Protection Act of 2000 (Public Law 106-224, 7 USC § 7701); Federal Noxious Weed Act of 1974, as amended (USC §§ 2801-2814); EO 13112 of February 3, 1999
	Initiation of Section 7 consultation	Section 7 of the Endangered Species Act (ESA), as amended (16 USC et seq.)
	Paleontological Resource Use Permit; approval for surveys and potential data collection as determined necessary	FLPMA (302[b])
	Identify and comply with Native American Religious Concerns	American Indian Religious Freedom Act of 1978 (42 USC § 1996)
NRC	NRC to issue a Source and Byproduct Materials License (not submitted)	Requirements under Title 10 CFR § 40 (Domestic Licensing of Source Material) and Title 10 CFR § 51 (Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions)
United States Environmental Protection Agency (EPA)	National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (not submitted)	40 CFR § 61 Subpart A General provisions that must be met by any NESHAPs facility. (Approval for construction may be granted under Section 61.08) 40 CFR § 61 Subpart B (The standard in 61.22 requires that emissions of Rn-222 in ambient air from an underground mine shall not exceed an amount that would cause any member of the public to receive an effective dose equivalent of 10 mrem/yr) 40 CFR § 61 Subpart W (Subpart W is currently undergoing revision and the applicable standards for the uranium production facility may be changed)
United States Fish and Wildlife Service (FWS)	Informal or formal consultation under Section 7; Coordination under Section 9 (not necessary)	ESA of 1973, as amended (Public Law 93-205)
	Protection of birds that live, reproduce or migrate within or across international borders (not completed)	Migratory Bird Treaty Act (MBTA) of 1918, as amended
	Protection of bald and golden eagles (not completed)	Bald and Golden Eagle Protection Act (BGEPA) of 1940, as amended (16 USC § 668(a); 50 CFR § 22)
State Agencies		
Wyoming Department of Environmental Quality - Water Quality Division (WDEQ-WQD)	Permit for evaporation ponds (not completed)	WDEQ-WQD Water Quality Rules and Regulations Chapter 3, Regulations for Permit to Construct, Install or Modify Public Water Supplies, Wastewater Facilities and Other Facilities Capable of Causing or Contributing to Pollution

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
	WYPDES Stormwater discharge Permit (Permit WYR000285 Approved Surface Water Pollution Prevention Plan (SWPPP) to be updated as mining progresses)	WDEQ-WQD Water Quality Rules and Regulations Chapter 2, Permit Regulations For Discharges to Wyoming Surface Waters
	WYPDES Dewatering Discharge Permit (Permit WY0095702 approved)	
WDEQ-LQD	Permit to Mine 381C (revision approved)	1973 Wyoming Environmental Quality Act
Wyoming Department of Environmental Quality - Air Quality Division (WDEQ-AQD)	Air Quality Permit to Construct Air Quality Permit to Operate Permitting requirements under WDEQ-AQD Standards and Regulations, Chapter 6 (P0015550 approved)	Wyoming Environmental Quality Act, Article 2, Air Quality, as amended (Wyoming Statute 35-11-201 through 35-11-212)
	Prevention of Significant Deterioration (PSD) Program NESHAPs Pre-Construction Approval (Approved Application #A0000220)	Clean Air Act, as amended (42 USC § 7401 et seq.)
Wyoming Game and Fish Department (WGFD)	Determine compliance through external review for greater sage-grouse core areas and management recommendations (completed, future consultations to be completed as necessary)	Wyoming EO 2015-4
	Consult on Mitigation Measures as Required, Including Protection of Raptors from Power Lines (not completed, future consultation to be completed as necessary)	Wyoming Statute 35-11-406(b)(xiii), LQD NonCoal Rules, Chapter 2, Section 1(f), and WDEQ-LQD Guideline No. 5 (Wildlife)
Wyoming State Engineer's Office	Treatment Ponds Diversion Ditches Groundwater application for pit dewatering well Beneficial Use Appropriation (monitoring wells are in Energy Fuels' name, and water rights for groundwater are owned by Energy Fuels)	Wyoming Constitution, Article 8 and Title 41: Wyoming Water Statute
State Historic Preservation Officer	Review and compliance activities related to cultural resources (completed, future consultation to be completed as necessary)	Consultation under Section 106, National Historic Preservation Act - NHPA (36 CFR § 80)
Wyoming Department of Transportation (WYDOT)	Permits for oversize, over length, and overweight loads (not completed)	Chapters 17 and 20 of the Wyoming Highway Department Rules and Regulations
Wyoming Office of State Lands and Investments (WOSLI)	Traversing state lands off established roads or through construction of a new Right-of-Way (ROW), Management of State Uranium Lease (completed, future consultation to be completed as necessary)	WOSLI General Provisions (Wyoming Statutes 36-2-107 and 36-9-118)

Issuing Agency	Name and Nature of Permit/Approval	Regulatory Authority (if appropriate)
Wyoming Department of Fire Protection and electrical Safety	Determine compliance with the international building, fire, mechanical, and fuel gas codes, 2012 editions; permits for electrical and fire safety (not completed)	Wyoming Statute 35-9-106
Wyoming Highway Patrol Motor Carrier Division	Applicable placards for vehicles transporting hazardous materials (not completed)	Federal Motor Carrier Safety Administration Rules and Regulations (49 CFR §§ 300 – 399)
Local Agencies		
Fremont County Transportation Department	Access Permit for county roads used to access Project Area, signage and/or cattle guard permits for structures placed in county right-of-way, review and consultation for road improvements and maintenance agreements for access to and from the Project Area (not completed)	Fremont County Board of Commissioners
Fremont County Emergency Management	Reporting of hazardous materials, Right-to-Know Act for Sheep Mountain Mine and Mill and related transportation and storage (not completed)	Emergency Planning and Community Right-to-Know (EPCRA) 42-116-1-01 et seq.
Sweetwater County Land Use	Zoning, Construction, and Land Use permits for Sweetwater Mill site expansion, modifications (not completed)	Wyoming Statute 18-5-201 et seq.
Sweetwater County Public Works Department	Sweetwater County road licenses, permits, and county road use, improvement and maintenance agreements for access to and from the Sweetwater Mill site (not completed)	Wyoming Statute 24-1-104
Sweetwater County Emergency Management	Reporting of hazardous materials, Right-to-Know Act for Sweetwater Mill and related transportation and storage (not completed)	EPCRA 42-116-1-01 et seq.

1.4 PUBLIC PARTICIPATION

1.4.1 Public Participation and Scoping Summary

The Notice of Intent (NOI) to prepare an EIS for the Project was published in the Federal Register (76 FR 52688) on August 23, 2011, which included a detailed project description and BLM contact information.

On August 23, 2011, BLM issued press releases announcing their intent to prepare an EIS with information about the upcoming public scoping meetings. The press release was issued to local and state newspapers, including the Casper Star Tribune, Riverton Daily Ranger, Lander Journal, Wind River News, and the Rawlins Times. The press release was also distributed to K2TV news in Casper, and the Wyoming Congressional Delegation or their representatives. This press release provided information about the public scoping meeting dates, times, and locations.

In addition to the NOI, the BLM mailed 39 Dear Interested Party letters on August 26, 2011, notifying the public about the Project, the intent to prepare an EIS, and information about the scoping meetings.

The date, times, location, and number of attendees at the scoping meetings are provided in Table 1.4-1. The scoping meetings were conducted using an open house format. The informal open house format allows meeting attendees the opportunity to ask BLM representatives and the Project applicant questions about the Project and the NEPA process. Display boards showing maps of the proposed Project were provided to facilitate conversation. The proponent also supplied a power point slide presentation. Fact sheets were distributed to meeting attendees describing the proposed Project, the NEPA process, and how the public can be involved. Comment forms were available for the public to complete and submit to the BLM at the meeting, or for mailing to the BLM at a later date. Information on submittal of comments through the internet was also provided. The scoping period closed October 11, 2011.

Table 1.4-1
Scoping Meetings

Meeting Location	Meeting Date/Time	Number of Attendees Who Signed in
Fremont County Library Lander Branch 200 Amoretti Street Lander, Wyoming 82520	Tuesday, September 13, 2011 5-7 p.m.	7 Interested Public 3 Industry 6 BLM 16 Total
Fremont County Library Riverton Branch 1330 West Park Avenue Riverton, Wyoming 82501	Wednesday, September 14, 2011 5-7 p.m.	14 Interested Public 8 Industry 6 BLM 28 Total
Jeffrey City Fire Hall 140 Coyote Drive Jeffrey City, Wyoming 82310	Thursday, September 15, 2011 5-7 p.m.	7 Interested Public 4 Industry 4 BLM 15 Total

In response to Energy Fuels' modification of the Plan of Operations in August 2013, the BLM issued a press release on September 25, 2013 providing notice of the availability of the modification. The BLM accepted comments on the modification for 30 days ending October 24, 2013. No comments were received.

More details on the public scoping process, meetings, and the comments submitted can be found in the "Sheep Mountain Uranium EIS Scoping Summary Report" dated October 20, 2011, which was posted to the Project website hosted by the BLM (http://www.blm.gov/wy/st/en/info/NEPA/documents/lfo/sheepmtn.html).

A news release seeking public comment on the Draft EIS was posted on the BLM Lander Field Office website at: www.blm.gov/wy/st/en/info/news_room/2015/january/16lfo-sheepmtn.html on January 16, 2015. The Draft EIS was also posted on the website. Additionally, postcards and emails announcing the availability of the Draft EIS and soliciting public comments were sent to 54 Cooperating Agencies and 143 interested individuals. The BLM invited the public to provide comments on the Draft EIS for 45 days beginning January 16, 2015 through March 2, 2015. The BLM hosted a public meeting in Lander at the Fremont County Library on January 28, 2015.

Fourteen comment letters were received during the comment period, including six letters from state and federal agencies, one letter from a local government, one letter from business and industry, two letters from elected officials, one letter from an individual, and three letters from environmental advocacy groups. BLM reviewed the comments, provided responses to each comment, and where appropriate, incorporated responses into the FEIS. The comment response log is provided in Appendix 1-A.

1.4.2 Primary Issues from Public Scoping

BLM received a total of eight comment submittals (e.g., letter or comment form) containing 60 individual comments during the public scoping period. Following the close of the public scoping period, comments were compiled and analyzed to identify issues and concerns. Each comment was identified, reviewed, and entered into an electronic database. As comments were entered, contact information for the commenter was added or updated to the mailing list to ensure that all interested parties would receive information throughout the EIS process.

Information gained during scoping assists the BLM in identifying the potential environmental issues, alternatives, and mitigation measures associated with development of the proposed Project. The process provides a mechanism for narrowing the scope of issues so that analysis in the EIS can focus on areas of high interest and concern. A majority of the comments were related to cumulative impacts, mitigation and monitoring, potential impacts to range resources, water resources, and wildlife resources. The following list summarizes submitted concerns by topic category.

- *Alternatives.* Aspects of the Project that should be considered in discussions of alternatives include: phasing; reclamation and restoration criteria and timing; transportation routes; and wastewater treatment, storage, and disposal.

- *Mitigation and Monitoring.* Previous mining activities in the area have contributed to unreclaimed or poorly reclaimed surface disturbance. Surface reclamation in the area can be problematic. Groundwater restoration could be difficult, and the EIS should examine potential groundwater restoration issues; the timing, inspection, and enforcement of reclamation or restoration needs better definition, and appropriate bonding needs to be required.

- *Rangeland Resources*. The EIS should disclose potential impacts to area recreation, including hunting. Current land use includes grazing; the EIS should discuss both impacts of grazing to the existing vegetation and impacts to grazing and to grazing permit holders from the proposed Project.

- *Water Resources*. Concerns included potential impacts to both surface water and groundwater. Potential impacts to surface waters to be addressed include river sedimentation from runoff and erosion, protection of existing reclaimed waterbodies or impoundments, and the potential for selenium to become concentrated in evaporation ponds. Potential impacts to groundwater to be addressed include contamination of groundwater and aquifers. The potential for drawdown due to the mining process to impact area streams and springs, including reducing flows and causing contamination through communication with mine water, should also be addressed.

- *Wildlife Resources*. Changes in vegetation due to the proposed Project could impact wildlife, including greater sage-grouse, mule deer, and antelope. Issues relating to proposed evaporation ponds such as exposure pathways to wildlife, including migratory birds through drinking water are also of concern. A full description of mitigation for impacts to wildlife should be included, particularly for migratory birds. The Project needs to adhere to the MBTA. The potential for wildlife mortality due to Project-related traffic also should be analyzed.

- *NEPA Process and Public Participation*. The public desired assurance of a complete analysis of impacts.

- *Cumulative Impacts*. A description of any monitoring that will be incorporated or has been performed to determine area air quality should be included in the analysis description. Impact analysis should include a description of impacts from other uranium projects and non-mining projects in the region. Additionally, short- and long-term impacts to surface water and groundwater and impacts to livestock grazing due to multiple area projects should be discussed.

1.4.3 Agency Coordination and Consultation

1.4.3.1 Cooperating Agency Participation

The BLM identified state agencies, local governments, tribal governments, and other federal agencies with jurisdiction or special expertise for potentially impacted environmental resources associated with the Project. These agencies were extended the opportunity to become Cooperating Agencies for the development of this EIS, and be involved in the development of alternatives and mitigation measures. The agencies requesting Cooperating Agency status include the EPA, FWS, National Park Service (NPS), State of Wyoming, Fremont County, Carbon County, and Sweetwater County (Table 1.4-2). The NRC served as a consulting agency.

Cooperating Agencies were consulted throughout the development of this EIS to ensure a comprehensive analysis was performed. On September 28, 2011, the BLM and Cooperating Agencies were presented with a field tour by the proponent. The tour was for the benefit of those preparing the environmental analysis. The proponent described the location and its physical attributes, the development that has already occurred, the proposed plan of action, and answered questions. The tour adjourned and returned to Jeffrey City around 12:15 p.m. The Cooperating Agency Meeting began at 1 p.m. at the Jeffrey City Fire Hall. The meeting was open for public observation, with a public question period at the end of meeting. Comments provided by members of the public during these meetings either verbally or in writing were used to inform the discussions of the Cooperating Agencies in developing the EIS.

1.4.3.2 Native American Consultation

On September 5, 2012, the BLM and tribal representatives visited the Sheep Mountain Project Area. The purpose of the tour was to show tribal representatives the Project Area and elicit comments about the Project and sites of religious or cultural significance that may be in the area. A total of six tribes were contacted via letter, email, and phone calls to see if they wanted to send representatives to the field tour. Of the six tribes, two sent representatives to participate in the September 5, 2012 field tour.

No known archaeological sites were located in the Project Area from past surveying, so none were visited during the field tour, but the field tour looked at two nearby sites: the Crooks Gap Stage Station and an intact segment of the Rawlins to Fort Washakie Road.

1.4.3.3 SHPO Consultation

The BLM submitted cultural resource inventory reports for formal State Historic Preservation Officer (SHPO) review on May 31, 2012, and provided additional information to SHPO on July 10, 2012. On July 17, 2012, SHPO concurred with BLM's finding of No Adverse Effect and agreed that setting was no longer an aspect of integrity for the Crooks Gap Stage Station and Rawlins to Fort Washakie Road in this area. The BLM again consulted with SHPO on December 18, 2013, after additional disturbance areas were identified and inventoried. On January 17, 2014, SHPO determined that the one additional site identified, 48FR7357, was not eligible for inclusion in the NRHP.

Table 1.4-2
Cooperating Agencies

Agency	Name of Contact	Date of Response	Response
Local Agencies			
Fremont County Commission	Douglas L. Thompson, Chairman	04/21/2011	Requested to be a Cooperating Agency
Carbon County Commission	John Espy, Chairman Mike Kelly, Deputy County Attorney (contact) Sid Fox, Planning Director	02/06/2014	Requested to be a Cooperating Agency
Sweetwater County Commission	Wally Johnson, Chairman Mark Kot, Public Lands Planner (contact)	02/04/2014	Requested to be a Cooperating Agency
Popo Agie Conservation District	Jeri Trebelcock, Executive Director	Did not request to be a Cooperating Agency	
State of Wyoming			
Office of the Governor	Matt Mead, Governor Jeremiah Rieman, Policy Advisor (contact)	09/6/2011	Requested to be a Cooperating Agency
Game & Fish Department[1]	John Kennedy, Deputy Director Scott Gamo, Habitat Protection (contact) Linda Cope, Habitat Protection Gwen Booth, Secretary - Habitat Protection	09/06/2011[1]	Requested to be a Cooperating Agency
Department of Agriculture[1]	Doug Miyamoto, Director		
Department of Revenue[1]	Dan Noble, Director Craig Grenvick, Administrator - Mineral Tax Division		
Office of State Lands and Investments[1]	Bridget Hill, Director		
State Engineer's Office[1]	Patrick Tyrell, State Engineer Sue Lowry, Interstate Streams (contact)		
State Geological Survey[1]	Thomas Drean, State Geologist		
State Parks, Historic Sites, and Trails[1]	Milward Simpson, Director		
State Historic Preservation Officer[1]	Mary Hopkins, Historic Preservation Officer Richard Currit, NEPA Coordinator		
Governor's Planning Office[1]	Jessica Crowder (contact)		
Office of Tourism Board[1]	Diane Shober, Director		
Water Development Office[1]	Harry C. LaBonde, Director Phil Ogle, River Basin Planning Administrator (contact)		
Wyoming Business Council[1]	Roger Bower, West Central Regional Director		

Agency	Name of Contact	Date of Response	Response
Department of Environmental Quality[1]	Todd Parfitt, Director John Erickson, WDEQ-LQD District 2 Supervisor (contact) Mark Conrad, NEPA Coordinator		
Department of Transportation[1]	Greg Fredrick, Asst. Chief Engineer, Engineering and Planning		
Wyoming Livestock Board[1]	Doug Miyamoto, Director		
Oil and Gas Conservation Commission[1]	Mark Watson, Agency Supervisor		
State Forestry Division[1]	Bill Crapser, State Forester		
Federal Agencies			
EPA, Region 8	Dana Allen, Compliance Sector Lead	09/21/2011	Requested to be a Cooperating Agency
NPS Intermountain Region	Cheryl Eckhardt, Compliance Lee Kreutzer (contact)	10/03/2011	Requested to be a Cooperating Agency
FWS, Ecological Services Field Office	Nathan Darnall, Section 7 Pauline Hope, Sage-Grouse CCAA	09/21/2011	Requested to be a Cooperating Agency
NRC	James Park, Environmental Project Manager (contact)	09/16/2011	Consulting Agency

[1] The involvement of indicated state agencies as a Cooperating Agency is coordinated through the Office of the Wyoming Governor, which has accepted the role of Cooperating Agency.

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Chapter 2.0
Project Alternatives

2.1 INTRODUCTION

This chapter provides a description of the Project alternatives relative to the phases of the proposed development during Construction, Operations, and Reclamation including the Proposed Action, the BLM Mitigation Alternative, and the No Action Alternative. Alternatives that were considered but eliminated from further consideration are also described in this chapter. In developing the alternatives, the BLM followed guidance set forth in the BLM-NEPA Handbook H-1790-1 (BLM, 2008), which provides for the development of a range of reasonable alternatives. Based on this guidance, the BLM developed the following alternatives for analysis in this EIS. The BLM Mitigation Alternative is the BLM's preferred alternative.

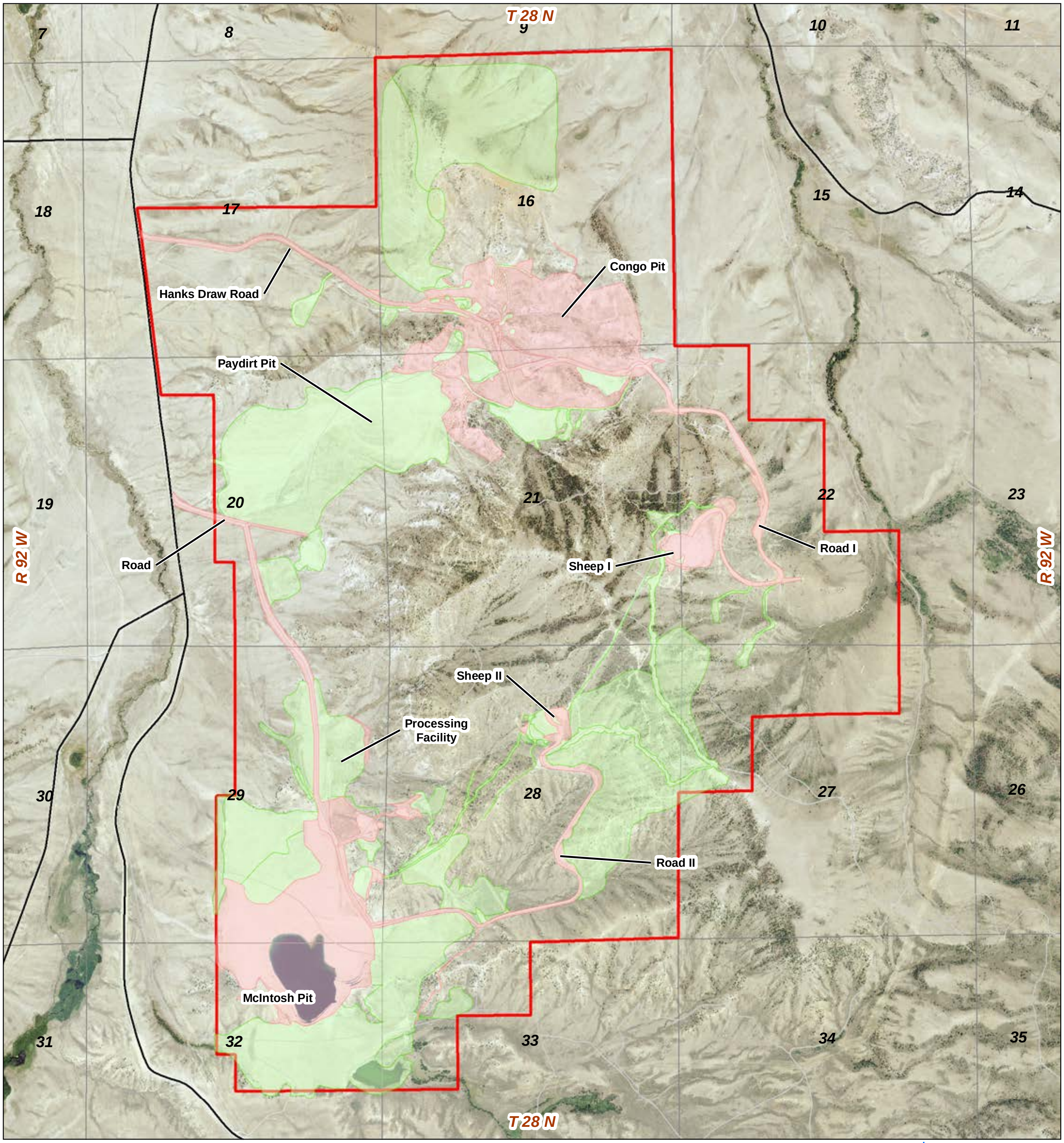
- The Proposed Action describes the proposed development and activities during Construction, Operations, and Reclamation described by Energy Fuels in the Plan of Operations including on-site processing or off-site processing (Energy Fuels, 2015a). The Plan of Operations is available on the BLM Project website for more information: http//www.blm.gov/wy/st/en/info/NEPA/documents/lfo/sheepmtn.html, and the WDEQ-LQD Permit to Mine 381C, on which the Plan of Operations is based, is also available on the BLM Project website and at the WDEQ-LQD offices in Lander and Cheyenne. The action is described in Section 2.3.
- The BLM Mitigation Alternative, which is the BLM's preferred alternative, consists of the Plan of Operations (the Proposed Action) with certain modifications of the Plan and additional mitigation measures with an emphasis on environmental resource conservation. The alternative is described in Section 2.4.
- The No Action Alternative assumes that approval of Energy Fuels' Sheep Mountain Uranium Project is denied, and existing infrastructure would be removed as required by existing permits, which include reclamation bonds. This alternative is discussed in Section 2.5.

The No Action Alternative and each of the Action Alternatives are discussed in terms of alternative-specific activities, alternative-specific design features, and surface disturbance summaries. Alternatives considered but eliminated from detailed analysis are discussed in Section 2.6. Section 2.7 is a comparison of the alternatives analyzed in this EIS.

2.2 LOCATION AND HISTORY

2.2.1 Project Location

The Sheep Mountain Uranium Project is located approximately 8 road miles south of Jeffrey City, Wyoming in Fremont County, Township 28 North, Range 92 West, Sections 16, 17, 20, 21, 22, 27, 28, 29, 32, and 33, 6th Principal Meridian. The Project Area lies approximately 62 road miles southeast of Riverton, approximately 67 road miles north of Rawlins, and approximately 105 road miles southwest of Casper, and is located on Jeffrey City and Crooks Peak U.S. Geological Survey (USGS) 7.5-minute topographic quadrangles. The general location is shown on Map 1.1-1 in Chapter 1, and the Project Area is shown on Map 2.2-1.



Map 2.2-1
Existing Disturbance

0 1,000 2,000 3,000
Feet

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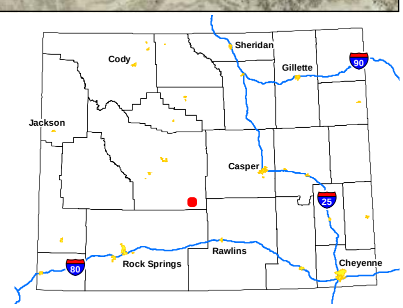
Sheep Mountain Project Area
Existing Disturbance (419.7 acres)
Reclaimed Disturbance (891.7 acres)



The primary access to the Sheep Mountain Uranium Project is along the Crooks Gap/Wamsutter Road (Fremont County Road - CR 318). From US Highway 287 at Jeffrey City, the primary access gate is reached by traveling south on the Crooks Gap/Wamsutter Road for approximately 8 miles. Though this is the primary access, the site can also be accessed from the south via Bairoil Road (Sweetwater CR 4-22) or Minerals Exploration Road (Sweetwater CR 4-63) and travelling north on Wamsutter Road (Sweetwater CR 4-23) and Crooks Gap/Wamsutter Road (see Map 1.1-1 in Chapter 1).

2.2.2 History of Mining at Sheep Mountain

2.2.2.1 Mining History

Uranium was first discovered in the Crooks Gap-Green Mountain Mining District which includes Sheep Mountain, in 1953 (WDEQ, 2015a). Claim staking and development rapidly followed, but not all of the prospects were commercially viable (USGS, 2015; Stephens, 1964). Several of those that were developed were within the current Project Area. Ores from earlier mining in the district were transported by truck to the Atomic Energy Commission buying station in Riverton, Wyoming. In 1957, Western Nuclear, Inc. (Western Nuclear) built the Split Rock Mill near Jeffrey City. That mill was supplied by several mines and produced approximately 27 million pounds of uranium oxide (U_3O_8) or “yellowcake” over its operating life. It is estimated that 20 million pounds of uranium has been mined from within the Sheep Mountain Project Area.

Several mining companies have owned and operated mines on Sheep Mountain since the start of commercial production in 1957. Continental Materials, Inc. operated the Seismic Open Pit and Reserve Shaft during the late 1950s and early 1960s but sold their holdings to Western Nuclear in 1972. Phelps Dodge Corporation developed and operated the Ravine and Congo inclines during the early 1960’s. Western Nuclear developed and operated the Paydirt Open Pit, Golden Goose I Shaft, and Heald Open Pit during the 1960s. In 1971, Phelps Dodge Corporation purchased Western Nuclear, and from that point on, mining on Sheep Mountain was carried out solely by Western Nuclear, a wholly owned subsidiary of Phelps Dodge Corporation.

Development projects on Sheep Mountain since 1972 include the Sheep Mountain I and II shafts, Golden Goose II Shaft, Sun Heald, and McIntosh N.E. underground mines and the McIntosh Open Pit. Pathfinder Corporation established an open pit uranium mine, the Big Eagle Mine, on Green Mountain within 3 miles of Western Nuclear's property in 1977. At that time, the local economy of the Jeffrey City-Sheep Mountain Sweetwater Valley region was based heavily on uranium mining, with ranching still playing a substantial but reduced role.

Western Nuclear ceased production from the area in 1982. In 1987, Pathfinder mines held an option on the property and produced limited tonnage from the Sheep I Shaft. U.S. Energy-Crested Corp. (USECC) acquired the properties from Western Nuclear in 1988 and completed some mine development through 2000. Subsequently, dewatering was discontinued and the mines were allowed to flood.

In December 2004, Uranium Power Corp. (UPC, then known as Bell Coast Capital) entered into a Purchase and Sales Agreement with USECC to acquire a 50 percent interest in the Sheep Mountain property. USECC sold the remainder of its uranium assets, including its 50 percent interest in Sheep Mountain to Uranium One Ventures USA Inc. in April 2007.

Titan Uranium Inc. acquired Uranium Power Corp's 50 percent interest in the property when it acquired UPC by a Plan of Arrangement in July 2009. The ownership was subsequently transferred to its wholly owned subsidiary, Titan Uranium USA Inc. The remaining 50 percent interest was purchased from Uranium One Ventures USA on October 1, 2009.

On February 29, 2012, Energy Fuels Inc. acquired Titan Uranium Inc., after which point Titan Uranium Inc. and all of its subsidiaries, including Titan Uranium USA Inc., became wholly-owned subsidiaries of Energy Fuels Inc. Later in 2012, Titan Uranium USA Inc., the operator of the Sheep Mountain Uranium Project, was renamed Energy Fuels Wyoming Inc. On August 27, 2013, Energy Fuels Resources (USA) Inc. submitted a Notification of Change of Operator for the Project from Energy Fuels Wyoming Inc. to Energy Fuels Resources (USA) Inc. (Energy Fuels, 2015a). Energy Fuels Wyoming Inc. continues to hold the project's claims, property, and other assets.

2.2.2.2 Reclamation History

While mining at Sheep Mountain began in the 1950s, the first mine permitting and reclamation requirements in Wyoming were implemented in 1969 through the Open Cut Reclamation Act. Operations conducted prior to the Open Cut Reclamation Act did not carry any mining company reclamation responsibilities. The reclamation requirements in the 1969 Act were relatively limited, e.g., reducing the height and slopes of mine spoil piles. Subsequently, in 1973, the Wyoming Environmental Quality Act was enacted and in 1975, the first mining and reclamation rules and regulations were promulgated under the 1973 Act. Since then, the rules and regulations have been periodically updated, and the mining and reclamation requirements have become more comprehensive. Since the early 1980s, the WDEQ Abandoned Mine Lands Division (WDEQ-AML) has conducted reclamation projects on mined areas for which there was no reclamation obligation (i.e., the mining predated the 1969 Act) or limited reclamation obligation, but which pose a safety hazard per WDEQ-AML criteria and for which funding is available.

Mine operations at Sheep Mountain were initially licensed under the 1969 Open Cut Reclamation Act and later permitted under the 1973 Act with the issuance of WDEQ-LQD Permit to Mine 381C, which remains active. However, some of the lands disturbed prior to the 1969 Act, which would not be re-disturbed by the permittee, were not included in the reclamation requirements of the permit. In addition, as a result of the 60-year history of mining and reclamation, various portions of the mine were operated and reclaimed under varying regulations and to varying reclamation standards.

Previous mine reclamation and existing disturbance, which are within the area of the WDEQ-LQD Permit to Mine 381C, are discussed under the No Action Alternative in Section 2.5. Map 2.2-1 provides an overview of the existing disturbances within the Project Area, and more detailed maps are provided in Section 2.5. Two areas of existing disturbance within the Project Area have qualified for reclamation by WDEQ-AML. WDEQ-AML partially reclaimed the Paydirt Pit several years ago and began reclamation of the McIntosh Pit in mid-2014. These WDEQ-AML projects are also discussed in Section 2.5.

In addition to various mining and reclamation, exploratory drilling has been on-going since the discovery of uranium in the 1950s. Thousands of exploration holes were drilled within the Project Area. As a result, historic (pre-1970s) drill holes and access roads remain un-reclaimed throughout much of the Project Area. Some of the drill holes may have been reclaimed several years ago through the WDEQ Abandoned Drill Hole Program. Drill holes and roads completed since the 1970s were abandoned according to the applicable rules and regulations in place during the time exploration occurred. Energy Fuels and their predecessors have mapped the majority of the old drill holes for safety purposes and ore body delineation, but information is not necessarily available to locate all of the old drill holes.

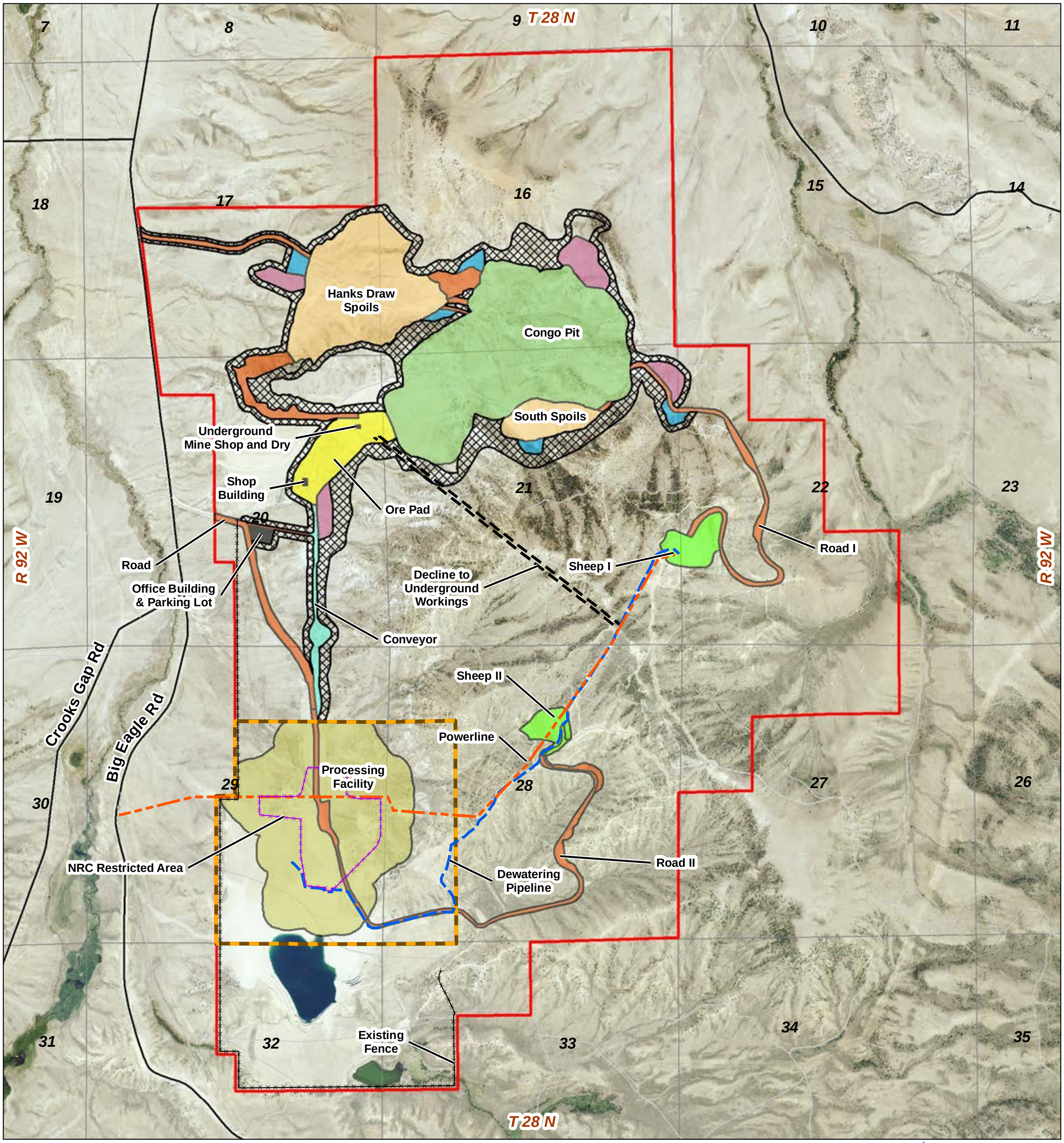
Titan Uranium Inc. completed additional drilling from 2009-2011 under two BLM Notice Level Operations, resulting in a total surface disturbance of less than 10 acres. These drill holes have been abandoned in accordance with state regulations including plugging of the drill holes and reclamation of the drill pads and access roads.

2.3 PROPOSED ACTION

Energy Fuels proposes to explore for, and develop uranium reserves to extract approximately 1.0 million to 2.0 million pounds of U_3O_8 or yellowcake from the ore per year during active operations (estimated at 20 years). Mining would be completed using conventional methods including both open pit and underground methods. The main components of the Project are illustrated on Map 2.3-1. Surface and mineral ownership is discussed in Section 2.3.1, and the proposed surface disturbance is discussed in Section 2.3.2. There are three principal phases in the Proposed Action: Construction, Operations, and Reclamation. These phases are summarized below and discussed in more detail in Sections 2.3.3, 2.3.4, and 2.3.5, respectively. The schedule is discussed in Section 2.3.6, followed by sections on Project-specific information that would affect the environmental analysis (including workforce, traffic, transportation, waste management, water management, and baseline data collection and monitoring). Table 2.4-1 (below in Section 2.4, BLM Mitigation Alternative) shows both applicant-committed mitigation measures in the Proposed Action and the BLM proposed additional mitigation measures (in the BLM Mitigation Alternative).

Description of the Proposed Action is derived from various documents submitted by Energy Fuels or the predecessor permit holder. Energy Fuels' Plan of Operations (Energy Fuels, 2015a) describes the Proposed Action in the detail necessary to satisfy the BLM's 43 CFR § 3809.401 requirements, and is the principal document used to summarize the Proposed Action. On January 9, 2014, Energy Fuels submitted a revision application to WDEQ-LQD for the 1975 Permit to Mine 381C and the revision was approved on July 8, 2015. Additional details specific to the mining operations and reclamation are presented in this application.

In addition to the BLM and WDEQ permitting documents, Energy Fuels would submit detailed descriptions of the On-Site Ore Processing Facility and associated impacts to the NRC as part of a required uranium mill license application. The NRC license application would also require separate and additional environmental review under NEPA. The NRC authority to regulate the ore processing facility comes from the Atomic Energy Act of 1954 (42 USC § 2011 *et seq.*). Per Section 11(e)(2) of the Act, materials which are "tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content" are defined as 11(e)(2) byproduct materials and are subject to regulation by the NRC under 10 CFR § 40. Reclamation of the facility would be done in accordance with NRC requirements for long-term care and maintenance of 11(e)(2) byproduct material disposal sites, and the facility would be transferred to either the State of Wyoming or the United States Department of Energy (DOE) per 10 CFR § 40.28 (DOE, 2012).



Map 2.3-1
Proposed Action Disturbance Footprint

Sheep Mountain Project Area
Proposed NRC License Boundary

Proposed Action Disturbance Footprint (929.0 Acres)

- Congo Pit (216.3 Acres)
- Processing Facility (205.3 Acres)
- Ore Pad (30.5 Acres)
- Pad (26.1 Acres)
- Topsoil Stockpile (27.9 Acres)
- Spoils (123.7 Acres)
- Ponds (18.2 Acres)
- Conveyor (10.4 Acres)
- Roads (84.9 Acres)
- Buildings and Parking (2.7 Acres)
- Disturbance Buffer (183.0 Acres)

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Construction includes the building of facilities and installation of equipment that would be needed prior to Operations. Operations would include the mining and processing of uranium ore. Conventional open pit (Congo Pit) and modified room and pillar underground (Sheep Underground Mine) mining methods would be used to remove mineralized material. Ore from both the Congo Pit and the Sheep Underground Mine would be stockpiled at the entry to the Sheep Underground Mine on the Ore Pad for later transport to one of the following processing facilities:

- An On-Site Ore Processing Facility. This would be licensed by the NRC as a uranium processing facility (see Figure 2.3-1 in Section 2.3.3.7). Ore would be transported to this Facility via conveyor, which would be within the Project Area. The Facility would include a Heap Leach Pad for dissolution of the uranium from the ore; a series of Treatment Ponds (Raffinate Pond, Collection Pond, and Holding Pond) for the solution from the Pad; an Extraction Plant for removing the ore from solution, and a Precipitation and Packaging Plant. In accordance with NRC requirements, the facility would be designed so all non-reusable wastewater would be disposed of through natural or mechanically enhanced evaporation within the Holding Pond and off-site discharge would be prevented.

- An Off-Site Ore Processing Facility. Ore would be transported from the Mine via truck to the Sweetwater Mill (Map 1.1-1). The Sweetwater Mill is owned and operated by Kennecott Uranium Company (Kennecott), a division of Rio Tinto Americas, Inc. The mill is located entirely on private lands owned by Kennecott.

The option to pursue off-site processing is a sub-part of the Proposed Action because it is advanced by Energy Fuels. Energy Fuels has determined that the only reasonably foreseeable processing options at this time include either processing ore on-site or processing ore off-site at the Sweetwater Mill. Energy Fuels' selection of a site for ore processing would be based primarily on economic factors. Analysis of the Proposed Action assumes that an on-site processing facility would be constructed and that ore would be processed on-site. It also considers the possibility that an on-site processing facility would not be constructed and ore would be processed off-site. The Sweetwater Mill (owned and operated by Kennecott) is located entirely on private lands owned by Kennecott and licensed by the NRC as an operating mill under Source Material License SUA-1350 which allows for production of 4,100,000 pounds of yellowcake per year. Therefore, Kennecott could begin operations under its NRC license subject to a pre-operational inspection and prior NRC notification. For the purpose of analysis within this EIS, it is assumed that operations at the Sweetwater Mill would occur under the existing license without significant revisions, and impacts associated with the operations of the mill would be similar to those of the operation of the Heap Leach Pad at Sheep Mountain and/or the Piñon Ridge Mill in Colorado in relation to applicable resources such as air and human health and safety. The impacts associated with hauling ore to the Sweetwater Mill from the Sheep Mountain Project Area and operating the Sweetwater Mill are disclosed in this EIS because they are connected actions. Potential impacts could occur to air, transportation, wildlife, and other resources and are described in Chapter 4. However, the BLM would not be involved in permitting or authorizing hauling of ore to the Sweetwater Mill along county roads or processing at the Sweetwater Mill. Therefore, the Proposed Action as analyzed in this document consists of two separate options, either on-site processing or off-site processing (not both).

Reclamation would include decommissioning of facilities, backfilling, and revegetating of the mined areas, and covering of the Heap Leach Pad to prepare for long-term care and maintenance by the State of Wyoming or the DOE. Surface disturbance associated with the Proposed Action is shown in Table 2.3-1, below.

2.3.1 Surface and Mineral Ownership

Map 2.3-2 provides an overview of the surface and mineral ownership in the Sheep Mountain Project Area. Mining and on-site ore processing under the Proposed Action would occur within the Project Area, which encompasses the WDEQ-LQD Permit to Mine 381C Permit Area and the proposed NRC License Area. The NRC License Area would be excluded from the WDEQ-LQD Permit to Mine 381C Permit Area.

The Project Area includes approximately 3,611 surface acres (~5.6 square miles) of mixed ownership including ~2,316 acres of federal surface, 772 acres under state ownership, and 523 acres of private lands. Approximately 2,838 acres of federal mineral estate is included in the Project Area. The Sweetwater Mill is located on private lands entirely owned by Kennecott.

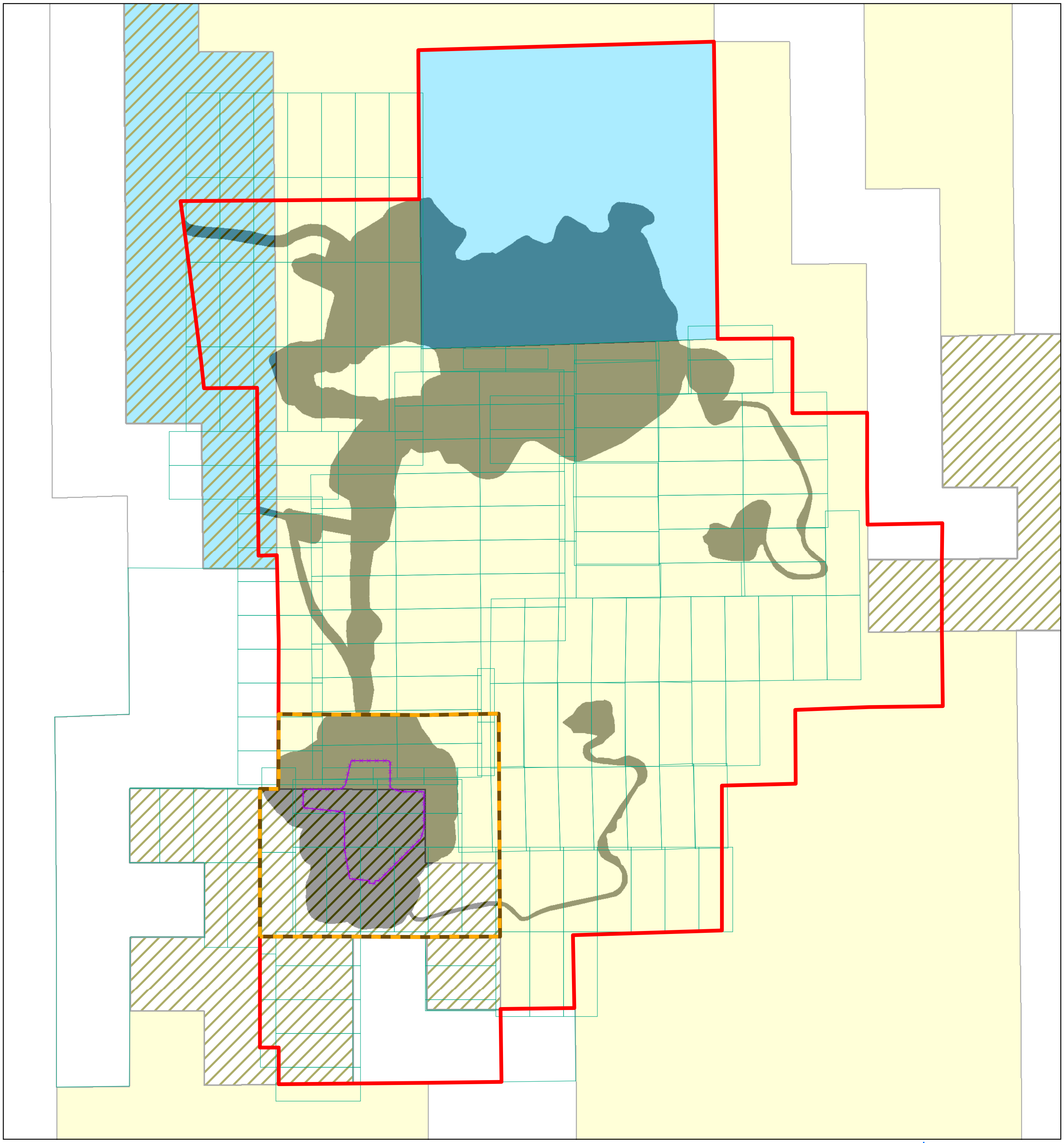
2.3.2 Proposed Surface Disturbance

Map 2.3-1 provides an overview of the surface disturbance and notes the proposed acreage for each project component. Map 2.3-2 provides an overview of the surface disturbance associated with the Proposed Action in relation to surface and mineral ownership. The Proposed Action would require 929.0 acres of disturbance of which 356.5 acres would be new disturbance and 572.5 acres was previously disturbed. Included in these disturbance acreages are 183.0 acres that could potentially be disturbed (130.7 acres of new disturbance and 52.4 acres of previous disturbance) that form a 100-foot buffer zone around the proposed disturbance to accommodate surface water drainage features, potential additional future disturbances, or modifications to the design of mine features. Most of the new disturbance is associated with the Congo Pit, the On-Site Ore Processing Facility, and the Hanks Draw Spoils Facility. Table 2.3-1 provides a summary of the proposed new disturbance and re-disturbance by project component for the Proposed Action.

Table 2.3-1
Estimates of Proposed Surface Disturbance - Proposed Action

Project Component	Total Proposed Action Footprint[1] (acres)	New Disturbance (acres)	Re-Use of Disturbed Area[2] (acres)
Congo Pit	216.3	11.2	205.1
Ore Pad	30.5	0.0	30.5
Roads[3]	85.0	11.1	73.8
Topsoil Stockpiles[4]	27.9	24.9	3.0
Spoils (Hanks Draw and South Spoils Facilities)	123.7	82.4	41.3
Sheep I and Sheep II Pads	26.1	0.0	26.1
Ponds	18.2	16.2	2.0
Conveyor	10.4	6.7	3.8
Buildings and Parking	2.7	2.4	0.3
Mine Area Disturbance Subtotal	**540.8**	**154.9**	**385.9**
Disturbance Buffer (33.8%)[5]	183.0	130.6	52.4
Mine Area Disturbance Total	**723.8**	**285.5**	**438.3**
Processing Facility	205.2	71.0	134.2
Project Area Disturbance Total	**929.0**	**356.5**	**572.5**

[1] Includes mine support facilities, processing plants, heap leach, ponds, and reclamation footprint.
[2] Re-use of disturbed area represents previously disturbed ground that is in various stages of reclamation or remains un-reclaimed from past mining.
[3] Includes use of existing roads and new roads.
[4] Includes existing and proposed topsoil stockpiles.
[5] A 33.8 percent increase represents a 100 ft. buffer zone around the proposed disturbances associated with mining to accommodate surface water drainage features and equals 183 acres.



Map 2.3-2
Surface and Mineral Ownership

N

0 1,000 2,000 3,000 Feet

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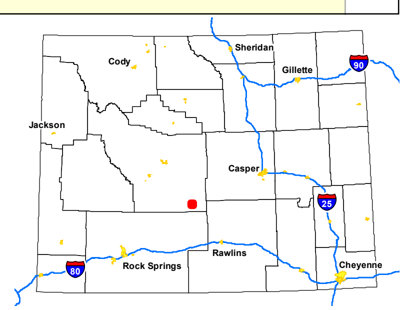
Sheep Mountain Project Area
Claims
Proposed NRC License Boundary
NRC Restricted Area

Surface, Mineral
Federal, Federal
State, Federal
Private, Federal
State, State
Private, Private



2.3.3 Construction

2.3.3.1 Overview

For analysis purposes, it is assumed that ore would be processed either on-site at a processing facility constructed in the Project Area or off-site at the Sweetwater Mill. If ore is processed at the Sweetwater Mill, the On-Site Ore Processing Facility would not be constructed. The Construction phase of the Project would include the installation of various roads, buildings, utilities, and infrastructure that would be necessary for Operations to begin. Prior to the start of Operations, access roads and utilities would be installed. Mine support facilities such as an administrative office, shop, warehouse, and guard house for the Congo Pit surface mine, would be constructed before mining could occur. The Ore Pad and conveyor system would be constructed near the entry point to the proposed new double entry decline needed to access mineralized zones, in the Sheep Underground Mine, which are too deep to be recovered through the Congo Pit (see Map 2.3-1).

Construction of the double entry decline would be deferred up to 5 years after the start of the Congo Pit operation. For on-site ore processing, a Processing Facility consisting of a 40-acre Heap Leach Pad, Treatment Ponds, Extraction Plant, and Processing and Packaging Plant would be constructed in the southwest corner of the Project Area.

Site access and facilities are shown on Map 2.3-1. Although some of the construction would be phased as Operations take place, all construction and associated surface disturbance is analyzed as occurring in the first year. This approach ensures that the maximum possible level of disturbance and associated impacts (e.g., air emissions) are identified in this EIS, although some construction and disturbance would occur at different times. The various construction components, the surface disturbance associated with each, and any interim reclamation are described further in the following sections.

2.3.3.2 Topsoil and Coversoil Salvage and Protection

Three sources of topsoil or other suitable plant growth material (coversoil) have been identified for salvage and protection during Construction and Operations for subsequent use during Reclamation. These sources and the associated quantities of topsoil and coversoil are discussed in detail in Section 3.6 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). The first source includes existing topsoil stockpiles, created during previous activities at the site, and these stockpiles would continue to be protected for future use during reclamation. Second, topsoil identified during baseline soil surveys (see Section 3.2.4) would be salvaged. Third, other suitable plant growth material was identified during baseline soil surveys within the Project Area (Section 3.2.4), and this material would also be salvaged for reclamation purposes during reclamation.

Topsoil and coversoil would be salvaged to the maximum extent practicable during excavation and would be accomplished using a scraper, dozer, motor grader, or other equipment capable of selective excavation of topsoil. The salvage would be directed by trained ground control personnel experienced with the identification of topsoil and other suitable plant growth material. Salvaged topsoil and coversoil would be placed in designated stockpile areas. All stockpiles would be neatly dressed, stabilized with an interim seed mixture approved by the BLM and WDEQ-LQD, and clearly signed.

2.3.3.3 Roads and Access

Access roads to, and travel routes within, the Project Area are displayed on Maps 1.1-1 and 2.3-1, respectively, and are further described in the Transportation Plan (see Appendix 2-A). Access to the site from US Highway 287 at Jeffrey City is south via the Crooks Gap/Wamsutter Road/Fremont CR 318. Within the Project Area, the majority of roads and utilities are pre-existing from previous mining operations or are under an existing right-of-way. During construction, the Project Access Road would be extended to the Congo Pit. The existing Hanks Draw Road would be partially covered by the Hanks Draw Spoils Facility, with the remaining road removed and reclaimed once it is no longer needed to support exploration and mining. Energy Fuels would obtain the necessary permits from the Wyoming Office of State Lands and Investment (WOSLI) to utilize the portions of Hanks Draw and Project access roads that traverse state trust lands.

Access to the Sheep I Shaft would be provided by a constructed road along the southern end of the Congo Pit, within the limits of the disturbance buffer adjacent to the Congo Pit. A road would also be built from the mining facilities to the On-Site Ore Processing Facility. Some existing roads within the Project Area would be upgraded in order to address erosion issues. Disturbance associated with road construction and road upgrades, such as the installation of culverts and erosion control structures, are identified in Table 2.3-1 and on Map 2.3-1. Culverts and channels were sized in accordance with conventional techniques (e.g., CulvertMaster software), experience with culvert maintenance (e.g., minimum culvert size not susceptible to plugging), and site specific information as described in more detail in Section 3.7 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

Fencing would be limited to those areas where fencing is needed to preclude public access for safety reasons. The entire Project Area would not be fenced; however, appropriate signage would be posted around the site perimeter, and access at the site entrance would be controlled with a guard house manned during operating hours and locked at all other times. Access to the site would be controlled by barbed wire fencing and/or gating at all defined points of ingress and egress and internally at the “NRC Restricted Area” – an area that contains the uranium processing facility that would be external to the Permit to Mine 381C Permit Area but within the Project Area, once NRC licensing is complete. The NRC Restricted Area would be fenced with a chain link fence topped by barbed wire. The entrance to the NRC Restricted Area would be through a gate, which would be manned during operating hours and locked at all other times. The Hanks Draw Road would be gated and opened only as needed for deliveries (e.g., mine equipment, road materials), maintenance, and inspections. No additional fencing is proposed around the Congo Pit, spoils facilities, topsoil piles, or mining facilities.

The Mine Safety and Health Administration (MSHA) and State Mine Inspector’s Office would regulate public health and safety matters at the mine facilities. Any persons entering the site would be required to sign in; complete safety training as required by regulations; follow the mine’s safety rules and procedures that provide for compliance with MSHA and state regulations; and be equipped with proper Personal Protective Equipment (PPE) depending on which areas they wish to enter. The On-Site Ore Processing Facility would be regulated by the NRC and would have a different set of safety rules based on compliance with NRC regulations for uranium processing. In addition to the requirements for all persons entering the site, the NRC rules include procedures for monitoring radiation doses within the Ore Processing Facility and radiometric scanning of ore processing personnel, visitors, vehicles, and other equipment and materials prior to them leaving the NRC Restricted Area.

2.3.3.4 Utilities

The utilities needed for the Project include electrical, phone, natural gas, water (potable and non-potable), and septic service. Because the Sheep Mountain area has been previously mined, there are existing electric, phone, and natural gas services. Upgrade and adaption of this infrastructure would be necessary. Energy Fuels installed and upgraded overhead power lines in fall 2011 that run from the Big Eagle Road through the proposed processing facility to the Sheep I and Sheep II shafts (see Map 2.3-1). A separate power line runs through the proposed Congo Pit from Crooks Gap to the Sheep Creek Oil Field (east of the Project Area). Energy Fuels would relocate this power line during construction of the Congo Pit. The buildings would be heated using natural gas from an existing pipeline that comes into the Project Area, near the proposed On-Site Ore Processing Facility, from a main line located along Big Eagle Road. Electrical power and natural gas for the Office and other buildings located by the entrance would come from the Ore Processing Facility or as separate lines into the site from Crooks Gap/Wamsutter Road, using existing rights-of-ways. If necessary, existing rights-of-ways would be amended to include use of these facilities by Energy Fuels outside of the Project Area prior to construction.

Potable water would be obtained from the Jeffrey City Water and Sewer District via water trucks (Section 2.3.11.3 – Potable Water). Non-potable water for ore processing, dust suppression on the site roads, fire suppression systems, and washing equipment would be supplied by dewatering of the Congo Pit and Sheep shafts, as described in more detail in Section 2.3.11 (Water Management Plans). Septic service is described in Section 2.3.10.2 (Liquid Waste Management – Domestic Waste).

2.3.3.5 Congo Pit

The Construction phase of the Congo Pit would include installation of road networks and support facilities that are required before mining can begin. Roads starting at the southwest and northwest corners of the Congo Pit would be constructed to reach the Hanks Draw and South Spoils facilities and the Ore Pad (see Map 2.3-1).

Support facilities would consist of a guard house, the main office, mine shop, and warehouse located near the site entrance. Portable trailers with bathrooms would be set on the Ore Pad to serve as a meeting and lunch area for the crews. A fuel station would be on the Ore Pad for fueling mobile equipment. In consideration of the remoteness of the site and the potential hazardous winter driving conditions, emergency stores of nonperishable food and water would be kept on-site along with portable cots should it be necessary for personnel to remain on-site during adverse weather.

The previously reclaimed area of the Paydirt Pit (approximately 19 acres and west of the Congo Pit) would be reconstructed using mine spoils to accommodate the Ore Pad, crushing equipment conveyor, and surface facilities associated with the Sheep Underground Mine (see Map 2.3-1). The enclosed overland conveyor would travel from the Ore Pad to the On-Site Ore Processing Facility. It would be constructed approximately 20 feet off the ground, and the disturbance would be within the proposed road corridor extending from the Sheep Underground Mine to the On-Site Ore Processing Facility (see Map 2.3-1).

2.3.3.6 Sheep Underground Mine

Development of the Sheep Underground Mine would not occur until approximately Year 5 of the Project in order to allow for mine dewatering and rehabilitation of the underground workings. Underground mine development would start with mine dewatering and development of the new double entry decline starting at the Ore Pad (see Map 2.3-1). Prior to the start of production from the underground mine, the existing workings would be rehabilitated including: installing a ventilation system; re-bolting (as necessary); installing power, water, and compressed air lines; building haulage roadways; and, conducting long-hole drilling to delineate ore zones.

An estimated 19 acres of the reclaimed Paydirt Pit area would be re-disturbed during construction to build the underground mine support facilities. Most of this disturbed area would include the Ore Pad, crusher, conveyor loadout, and fuel station, which would also be used by the open pit operations. A small office building and shop and a dry (i.e., change house) would be located near the entrance to the decline. The office would be used by the shift and maintenance foreman and surface support personnel. The shop would be used to work on major repairs and rebuilds. Most other maintenance work would be performed in an underground mine shop. Current plans are to utilize the warehouse on the Ore Pad to support both the surface and underground operations.

2.3.3.7 On-Site Ore Processing Facility

The general layout for the facility, which would be in the southwest portion of the Project Area (see Map 2.3-1) is shown on Figure 2.3-1. The Facility would include a Heap Leach Pad; Treatment Ponds (Raffinate Pond, Collection Pond, and Holding Pond), Extraction Plant, and a Precipitation and Packaging Plant. An interim solid waste management area and a wash-down pad would also be included in the Facility. Access to the On-Site Ore Processing Facility would be controlled through the NRC Restricted Area for protection of public health and safety. No surface or groundwater discharge would occur from the On-Site Ore Processing Facility.

The majority of the Facility would be located on private lands owned by Energy Fuels and on existing spoils from the nearby McIntosh Pit. Construction would be designed to avoid potential conflict with WDEQ-AML reclamation of the McIntosh Pit, which is described in Chapter 5.

The NRC has the primary responsibility to authorize the design, construction, and management of the On-Site Ore Processing Facility due to the presence of source material and 11(e)(2) byproduct material. The design described herein has been discussed with, but not yet approved by, the NRC, and it is included to provide sufficient information for analysis of the potential impacts of the Project addressed in this EIS. As noted in Section 2.3, the NRC licensing process would require separate and additional environmental review under NEPA.

While surface disturbance on BLM-managed lands within the NRC License Area is within the BLM's jurisdiction, the BLM defers to all matters contained within the NRC License Area to the NRC with regard to ore processing design, operation, closure, and reclamation. For purposes of analysis, this EIS assumes that all required approvals from the NRC, WDEQ, and other federal, state, and local agencies would be obtained before Construction and Operations begin.

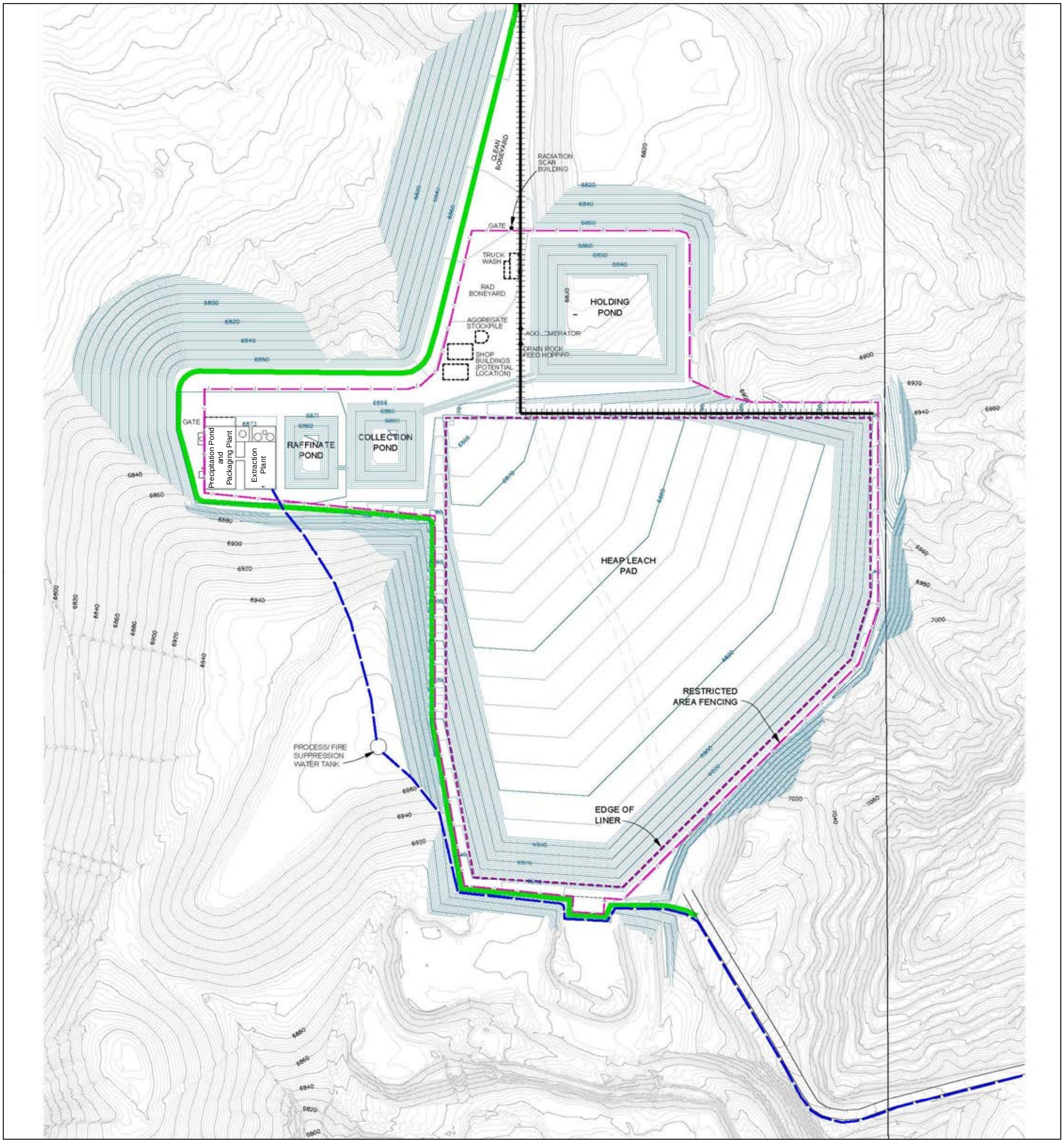


Figure 2.3-1
Processing Facility Site Layout

LEGEND

- EXISTING ELEVATION
- PROPOSED ELEVATION
- RESTRICTED AREA
- PROPOSED ACCESS ROAD
- EDGE OF LINER
- PROPOSED CONVEYOR ALIGNMENT
- DEWATERING PIPELINE ALIGNMENT

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2.3.3.7.1 Heap Leach Pad

The Heap Leach Pad would be constructed by excavating the 40-acre pad to design grades in accordance 10 CFR § 40, including Appendix A to 10 CFR § 40, because the majority of the pad would be below the ground surface. A 20 foot-wide access road would be constructed around the perimeter. The northwest-facing portion of the pad would daylight towards the Treatment Ponds and the Extraction and Precipitation and Packaging plants (see Figure 2.3-1). The perimeter of the Heap Leach Pad would be ditched to divert stormwater runoff around the pad.

Leach solution would be pumped to the active leach area of the Heap Leach Pad from the Raffinate Pond via a pump and a main pipeline. The main pipeline would be equipped with lateral lines to allow for distribution of the solution over the levelled pad area. A drip emitter system would be used to apply the barren solution to the top of the heap at an established solution application rate.

Energy Fuels is proposing a triple liner containment system with two leak detection systems. The following description of the liner and pad system is derived from the Plan of Operations (Energy Fuels, 2015a). The NRC has the regulatory authority for approving the design. The following description is provided to help the reader understand Energy Fuels' proposal and provide a basis for analysis in this EIS. The adequacy of this design meets BLM's minimal Performance Standards (43 CFR § 3809.420), but adequacy of the details of the engineered design is not part of the BLM's decision in this EIS.

The 40-acre Heap Leach Pad would be constructed either in phases or all at once, and when completed, would include six cells. The ground for the pad would first be graded and compacted with a shallow slope (minimum of 1 percent) towards the northwest. The foundation for the pad would be built by compacting the existing subgrade material. A triple liner containment system, which incorporates two leak detection systems, would be installed on top of the prepared subgrade materials. The lowermost layer (tertiary liner) would consist of a 60-mil high density polyethylene (HDPE) Super Gripnet® drain liner as manufactured by Agru America (or approved equivalent). The layer would have spikes on the underside of the liner providing increased shearing resistance with the foundation, and drain studs on the top surface to provide drainage capacity for the secondary leak detection system. Above the tertiary liner, the secondary liner would consist of a 60-mil HDPE MicroDrain® liner as manufactured by Agru America (or approved equivalent) with Micro Spike® texturing on the underside (adjacent to the drain side of the tertiary liner), and drain studs on the top surface to provide drainage capacity for the primary leak detection system. By incorporating the drain liner, the need for separate drainage geonet layers is eliminated. Above the secondary liner, a 60-mil HDPE Micro Spike® liner would be installed as the primary liner, with texturing on both sides for increased frictional resistance. The rolls of liner material would be joined together using heat fusion equipment. Leak detection sumps would be placed at low points between the primary and secondary liner, as well as between the secondary and tertiary liners. The sumps would be equipped with standpipes, which are used to access the sump for monitoring purposes and to pump out any collected solution. Collection pipes would be placed directly over the primary liner in order to enhance solution collection while minimizing solution head on the liner system. Above the synthetic lining system and collection pipe network, a minimum of 24 inches of gravel overliner materials would be placed as both a drainage layer and a cushioning layer to protect the liner from damage by equipment.

Detailed schematics and descriptions of the Heap Leach Pad and liner system would be provided in the license application to the NRC. The Heap Leach Pad would also contain a smaller cell within the southern portion of the pad that is specially engineered for the storage and disposal of solid waste generated during processing.

2.3.3.7.2 Treatment Ponds

Three separate ponds, the Raffinate Pond, Collection Pond, and Holding Pond, would be constructed with triple liner and double leak detection systems. The location and approximate size of these ponds is shown on Figure 2.3-1.

The Raffinate Pond (approximately 1.01 acres) would store the lixiviant which is composed of water; an oxidizing agent, such as sodium chlorate ($NaClO_3$); and a complexing agent, such as sulfuric acid (H_2SO_4). The Raffinate Pond would receive recycled uranium depleted aqueous solution (raffinate) from the Extraction Plant which would be used as leach solution make-up and be applied to the Heap Leach Pad after the addition of chemical reagents. The chemical reagent levels within the ponds would be monitored, but composition would be controlled by automated systems with sensors. The pond would be sized to contain 3 days of make-up solution, plus 3 days of leach solution to wet fresh ore, plus the volume of water from a storm event (proposed 100-year, 24-hour event) over the Raffinate Pond plus an additional 5 feet of freeboard). Should the Raffinate Pond reach its freeboard limit, it would overflow by gravity via a double-lined overflow to the Collection Pond).

The Collection Pond (approximately 1.48 acres) would store uranium-rich aqueous solution, or Pregnant Leach Solution (PLS), that has drained from the Heap Leach Pad. PLS would be recirculated in the Collection Pond until it has reached the appropriate concentration to be transferred to the Extraction Plant. The chemical levels within the ponds would be monitored, but composition would be controlled by automated systems with sensors. The pond would be sized to contain 1 day of PLS from the active leach area, plus the volume of the 100-year, 24-hour storm event (proposed) over the Collection Pond and Heap Leach Pad areas (plus an additional 5 feet of freeboard). Should the Collection Pond reach its freeboard limit, it would overflow by gravity via a double-lined overflow to the Holding Pond.

The Holding Pond (approximately 5.35 acres) would be the largest of the three ponds and would be sized to hold runoff from the entire processing facility during a Probable Maximum Precipitation (PMP)/Probable Maximum Flood (PMF) event (the maximum possible precipitation and flood event based on available information) as defined by the NRC (NUREG 1623, Design for Erosion Protection for Long-Term Stabilization, 2002, page 10, Section 2.2.1.2) as well as all planned process liquid waste that could accumulate over a 3-month period at the facility. Additional pond depth would be included to account for wave motion and maintain freeboard (an additional 5 feet). Overflow drainage channels, with double-lined leak detection systems, would be constructed around the Collection Pond and Raffinate Pond to direct any overflow to the Holding Pond.

The primary purpose of the Holding Pond would be for the temporary storage and ultimate disposal of liquid waste. Liquid wastes from the Extraction and Precipitation plants would be treated and recycled when possible, but all non-reusable wastewater would be disposed of through natural or mechanically enhanced evaporation within the Holding Pond. Automated spray evaporators would be installed to accelerate the evaporation rate but would shut down in adverse weather conditions. Liquid waste might also be sprayed over the spent portions of the Heap Leach Pad as an alternative evaporative disposal method. Solids that precipitate out of the liquid waste would be periodically removed from the Pond and placed in the interim solid waste management area within the facility. The facility may be subject to EPA requirements (40 CFR § 61 Subpart W) pending current rulemaking efforts, because the ponds would contain uranium byproduct material (i.e., 11(e)(2) material).

The ponds would be covered with bird balls to deter waterfowl. Energy Fuels believes netting the pond is not possible due to the large size.

2.3.3.7.3 Extraction and Precipitation and Packaging Plants

Construction of these plants would include excavating foundations, completing earthwork, pouring concrete pads, and constructing the two main processing buildings: the Extraction Plant and the Precipitation and Packaging Plant. For the Extraction Plant, Energy Fuels is exploring the use of solvent extraction (SX) and/or ion exchange (IX) to extract the uranium from solution. Selection of an SX versus an IX system would have negligible surface impacts because the disturbance areas for the two processes would be similar. The processes would take place in the same size of building, over the same period of time, and recover the same amount of uranium (depending upon mineralization). Truck trips are not anticipated to change significantly between IX or SX (the Transportation Plan already accounts for a conservative estimate of materials hauling traffic). The SX system would require use of a large amount of organics, and therefore would require higher safety protocols including a robust fire suppression system. Either system would be required to meet all regulatory requirements (NRC requirements).

Additional details on the construction and design of these buildings and other associated structures can be found in Section 2.3.4.5. Both buildings would be constructed on privately-owned lands within the NRC License Area (see Map 2.3-1). Additional structures within the NRC License Area would consist of two small shop buildings, aggregate stockpiles, boneyard, and a truck wash.

2.3.4 Operations

2.3.4.1 Overview

The Operations phase would consist of mining uranium ore using conventional open pit (Congo Pit) and underground (Sheep Underground Mine) methods. In addition to developing the Congo Pit for recovery of shallow ore reserves, Energy Fuels would rehabilitate and further develop the Sheep Underground Mine for the recovery of deeper ore reserves. Ore from the Congo Pit and Sheep Underground Mine would be either transported via overland conveyor to the On-Site Ore Processing Facility and processed to produce U_3O_8 (yellowcake) or transported to the Sweetwater Mill for off-site processing

2.3.4.2 Congo Pit

Mining would initially occur within the Congo Pit (see Figure 2.3-2) starting at the northwest and moving southeast where ore zones deepen. Mining operations at the Congo Pit would be ongoing over 8 years. Table 2.3-2 provides the annual schedule for mining ore and spoils material from the Congo Pit and for placement of the spoils material. Surface disturbance associated with the Congo Pit would not occur all at once but would be sequenced over the life of the Project, as shown on Figure 2.3-2. Total disturbance at full development, including new disturbance and re-disturbance is listed in Table 2.3-1, above.

Table 2.3-2
Mine Sequence Quantities

Year	Total Excavated (CY)[1,2]	Hanks Draw Spoils Facility (CY)[1,3]	South Spoils Facility (CY)[1,3]	Intra-Pit Backfill (CY)[1,3]	Reclamation Backfill (CY)[1,3]
1	9,447,000	9,122,000	0	325,000	0
2	10,341,000	5,718,000	1,000,000	3,623,000	0
3	11,300,000	2,732,000	1,002,000	7,566,000	0
4	9,482,000	4,226,000	0	5,256,000	0
5	10,542,000	0	0	10,542,000	0
6	10,584,000	2,665,000	0	7,919,000	0
7	11,595,000	0	0	11,595,000	0
8	4,847,000	0	0	4,847,000	0
9	0	0	0	0	0
10	0	0	0	0	5,000,000
11	0	0	0	0	5,000,000
12	0	0	0	0	5,000,000
13	0	0	0	0	5,000,000
14	0	0	0	0	4,463,000
15	0	0	0	0	0
16	0	0	0	0	0
17	0	0	0	0	0
18	0	0	0	0	0
19	0	0	0	0	0
20	0	0	0	0	2,002,000
Totals	**78,138,000**	**24,463,000**	**2,002,000**	**51,673,000**	**26,465,000**

[1] CY = cubic yards.
[2] Total excavated volumes are inclusive of mineralized material (ore) and overburden/interburden (spoils), averaging 9.8 million CY per year over 8 years.
[3] Spoils and backfill volumes assume that the swell of excavated waste from the pit is equivalent to the volume of mineralized material removed from the pit.

Design practices and equipment that have been successfully used at similar open pit uranium mining operations throughout the west would be used for pit construction. Design details include highwalls with an average slope of 0.7 horizontal (H):1 vertical (V) (approximately 55 degrees). This reflects the average from a bench-cut highwall construction technique where 10-foot wide benches are cut every 50 feet on a 0.5H:1V slope (approximately 63 degrees). The average depth of the pit would be between 100 and 400 feet, but once fully excavated, the pit would reach a maximum depth of 600 feet near the southeast corner.

Because the Congo Pit overlies older mine workings, a ground control crew would be on site during excavation. The ground control crew would consist of an operator with a medium-sized excavator, an operator with a medium-sized dozer; and a field engineer with access to digital three-dimensional maps of the historic underground mines underneath the Congo Pit footprint.

Additional knowledge of the historic underground workings would be gained through shallow seismic testing and the daily excavation of the Congo Pit. This crew would work to collapse any mine voids through over-excavation and would subsequently backfill depressions using spoils at hand. Blasting within the Congo Pit would only be required to assist in the collapse of mine workings and would be conducted by a certified blasting operator in accordance with MSHA regulations (30 CFR §§ 55, 56, and 57). Slope stability monitoring in the Congo Pit and Hanks Draw Spoils Facility would include visual inspection for features such as tension cracks, bulges, and survey of control points by electronic distance measuring equipment or similar devices.

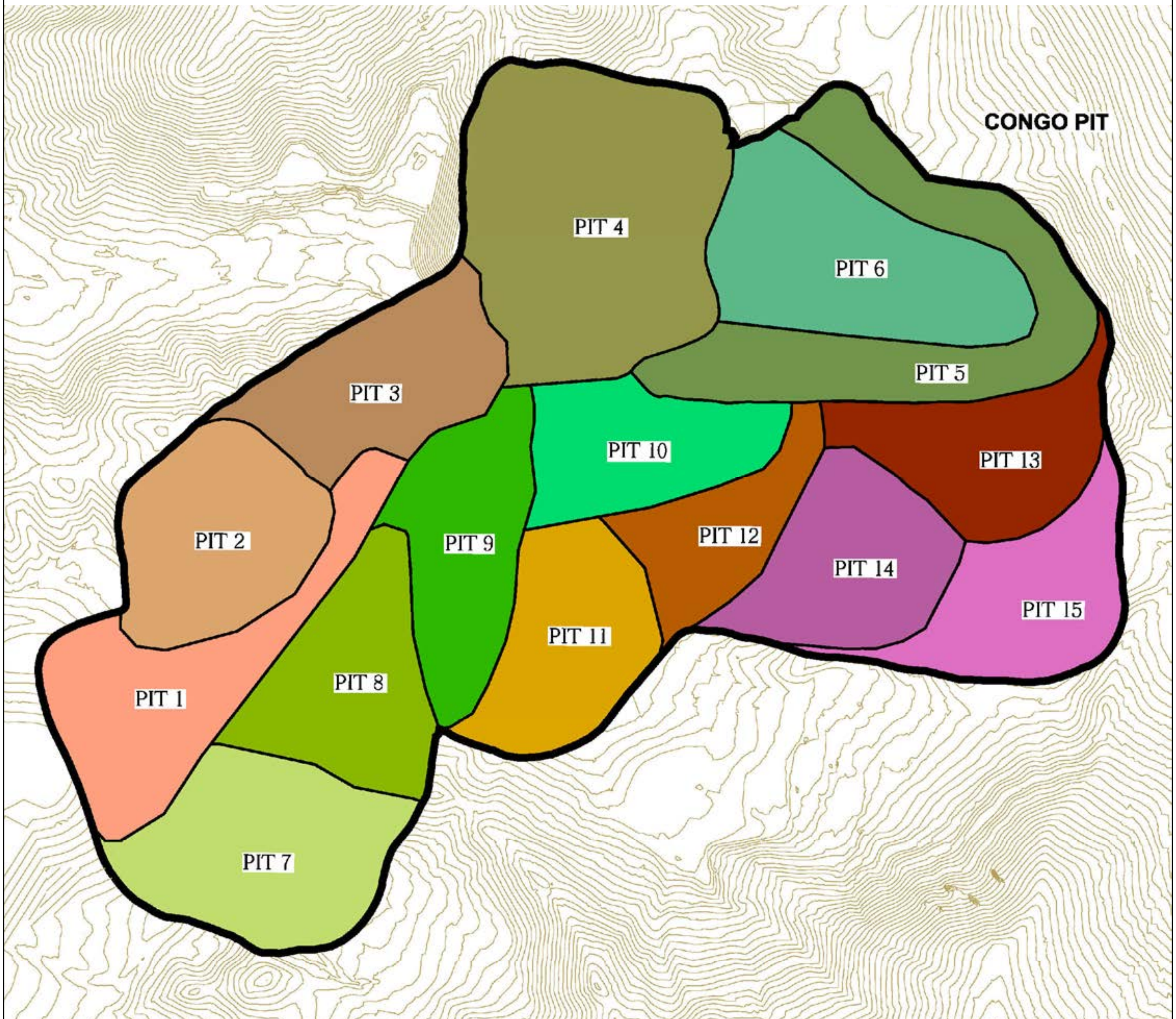

Figure 2.3-2
Congo Pit Sequence

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Ramps and haul roads within the Congo Pit would not exceed a 10 percent grade and would average between 4 percent and 8 percent in grade. Roads are planned to be a minimum of 40 feet in width with primary haulage roads up to 60 feet wide. Equipment would average 12 feet in width, and the proposed roads are designed to provide ample room for travel. Road construction details can be found in Section 2.3.9, Transportation.

Three design storms were used for sizing different flow control features at the Congo Pit and elsewhere in the Project Area, as discussed in more detail in Section 3.7.1.2 of the approved WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). The 25-year, 24-hour storm was selected as the design storm for sizing of diversions, culverts, and stilling basins. These features are designed to be temporary and would change frequently as mining progresses. Surface water inflow to the Congo Pit would be controlled by constructing diversion channels around the pit highwall crest. In addition to controlling stormwater runoff, the channel configuration would serve as a safety berm to prevent access to the highwall crest. Sediment ponds would capture runoff from the disturbed areas, such as the spoils piles. The sediment ponds would be sized to contain the 100-year, 24-hour storm plus ensure that the estimated sediment storage volume for one year is always available. Therefore, the sediment ponds are not intended to allow release of any water; however, the emergency sediment pond spillways would pass a minimum of the 25-year storm, in accordance with WDEQ regulations (Section C-31(c) of the WDEQ Water Quality Rules and Regulations (WDEQ, 1984)). The WDEQ regulations only require sediment ponds to impound the 10-year, 24-hour storm, (WDEQ, 1984) and the intent is to impound water long enough for the sediment to settle prior to discharge. However, due to concerns about the potential for radium in the discharge water, the sediment ponds in the Project Area were sized to not allow the release.

The pond and diversion feature designs were created with conventional techniques (e.g., SEDCAD4 software for pond designs) and site-specific data (e.g., particle size distribution), as detailed in Section D-6.2.2 of Appendix D-6 and Section 3.7.1 of the Mine Plan of the WDEQ-LQD Permit 381C (WDEQ, 2015a). The drainage subbasins used for the designs were delineated for each year of mine operation, with the Year 8 basin delineation shown on Figure 2.3-3. The system of ponds and diversion ditches and ponds would be built as the Congo Pit is mined. Locations of the surface water control features at the full extent of the pit, year 8 of the Project, (and including other areas of the site) are shown on Figure 2.3-4.

Additional measures including straw wattles, sediment fencing, and other Best Management Practices (BMPs) as described in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and Energy Fuels' Stormwater Pollution Prevention Plan (SWPPP) would be used to limit erosion and control sediment within and around the Congo Pit and elsewhere in the Project Area. The SWPPP would be updated as necessary throughout the life of the mine and a copy of the SWPPP would be maintained at the Mine Office. The State of Wyoming is the permitting authority for stormwater discharge.

The stormwater controls meet State of Wyoming requirements and would be updated accordingly throughout the Project development. It is recognized that the use of design storm events may not cover all the storm events encountered during the life of a Project, particularly given the variability of precipitation and snow melt in high desert environments. The WDEQ-LQD statutes and regulations provide for measures to address the possibility of unexpected events, including: inspections to ensure the surface water control features were properly constructed and are functioning (e.g., Sections VI and VII of WDEQ-LQD Guideline 15 – WDEQ, 2004); annual reports with evaluation of the extent to which "expectations and predictions" have been met (Wyoming Statute § 35-11-411); and designation of operator duties, including protection of soil and water (Wyoming Statute § 35-11-415).

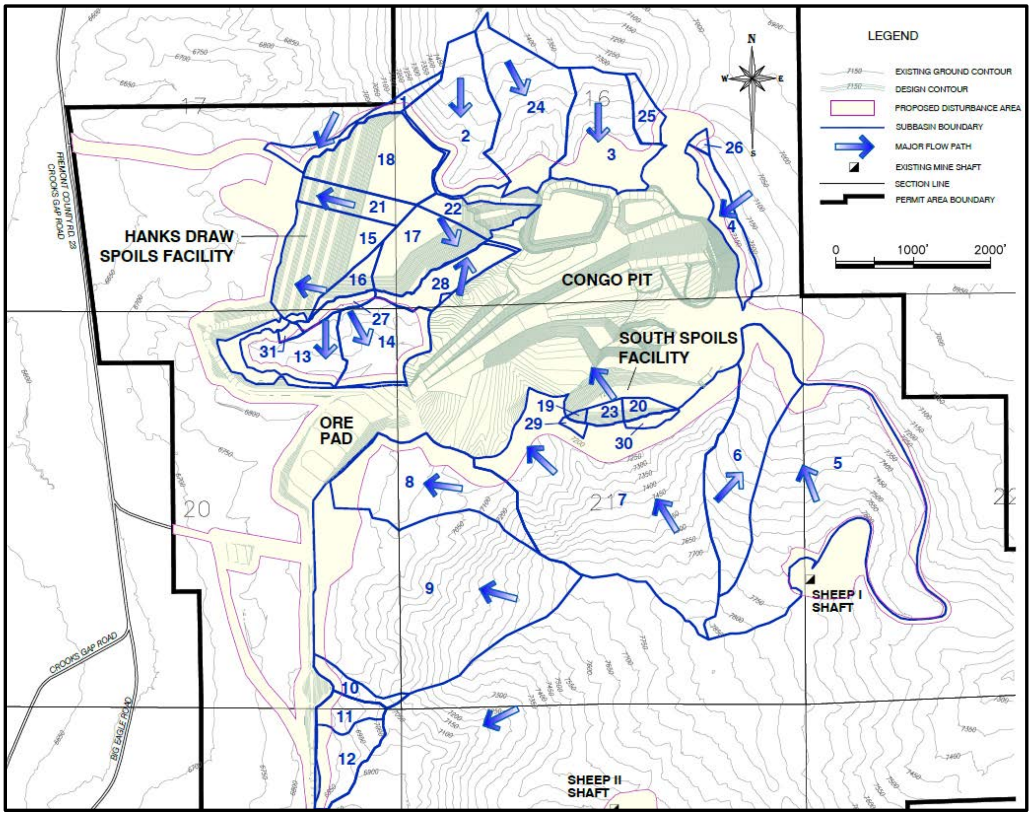


Figure 2.3-3
Drainage Subbasins for Design of Stormwater Management Control Features (Year 8, Full Scale Development)

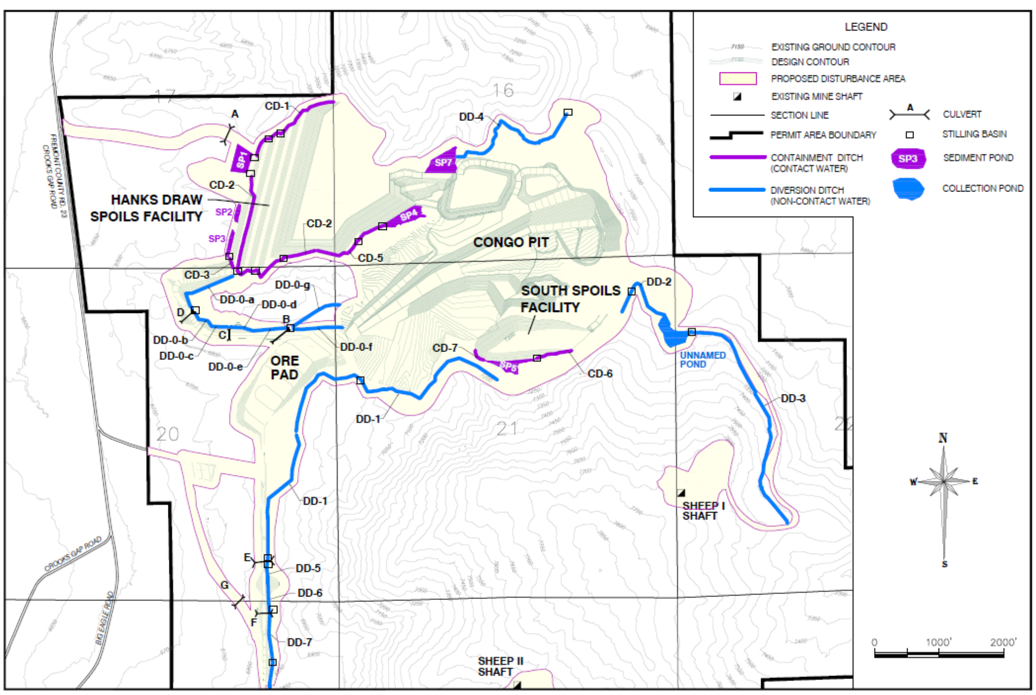


Figure 2.3-4
Proposed Stormwater Management Controls (Year 8, Full Scale Development)

Under the proposed schedule, excavation of the Congo Pit would intercept groundwater in the first year of mining at which point the lower portion of the pit would require dewatering. Energy Fuels anticipates a maximum of about 375 gallons per minute (gpm) of groundwater flow into the pit. A shallow angle pit floor would be maintained to drain water to the deepest part of the pit where a pump system would pump excess water out of the pit to a storage tank and/or pond. The water could then be used for dust suppression on haul and access roads where drainage is controlled. More information on water management is provided in Section 2.3.11.

To minimize waste and maximize production, Energy Fuels would establish an in-pit grade control program. This program would use trained personnel to conduct visual and radiometric scanning and map mineralized zones. Assays of the mineralized zones and ore trucks would be used to verify grades. The assays would be performed in a portable trailer equipped with laboratory analytical instruments. The trailer would be located in close proximity to the mining to allow for real-time data collection and evaluation.

The Congo Pit is essentially a single open pit that would be developed sequentially to accommodate the desired mine production and allow for internal backfilling. Mine development would work down dip from the shallowest deposits at the northwest end of the Congo Pit to the deepest deposits at the southeast end of the pit in 15 contiguous pits within the overall pit footprint (see Figure 2.3-2). Waste rock from the first pits would be hauled to the Hanks Draw Spoils Facility. Beginning with Pit 7, mine spoils would be replaced within the area of the pit previously mined. On-going backfill and reclamation efforts would be part of the proposed sequencing as described in Section 2.3.5.3. The actual sequence may vary as site conditions dictate, and updates would be reflected in the annual reporting process (Section 2.3.12).

During mining, excavated materials other than ore would be inspected and/or sampled to identify material that could be used for final cover and to identify material unsuitable for replacement at shallow depths. Material considered suitable for final cover (e.g., oxidized surficial mine overburden with low radiological levels) would be segregated and stockpiled similar to topsoil. Material considered unsuitable for replacement at shallow depths would be isolated and stored in the spoils facilities until final reclamation or placed for progressive backfill directly in the Congo Pit. Spoils that cannot be used as in-pit fill material from the Congo Pit and Sheep Underground Mine would be trucked and stored in two stockpile locations and used as grading fill in the existing Paydirt Pit. The Hanks Draw Spoils Facility would be located in Hanks Draw to the northwest of the Congo Pit. The South Spoils Facility would be located just south of the Congo Pit. The Hanks Draw Spoils Facility would encompass approximately 103 acres, at full build-out. The South Spoils Facility would encompass approximately 21 acres.

The spoils facilities would be constructed in a phased manner with vertical lifts of 50 feet or less and with safety berms around the pile perimeters. Spoils would be placed at the angle of repose (approximately 33 degrees) with minimum 10-foot wide set-back benches every 50 vertical feet to achieve an overall maximum slope of 1.7 H:1 V (i.e., 30.5 degrees). The lower lifts of the Hanks Draw Spoils Facility are designed at a flatter 3H:1V overall slope (i.e., 50-foot lifts at the angle of repose with a 75-foot wide safety bench) to enhance the stability. The stability of the Hanks Draw Spoils Facility under maximum build-out conditions was evaluated under static and earthquake-induced (i.e., pseudo-static) loading conditions, and the analyses were completed for the maximum height section, as well as the section with the steepest design slope (WDEQ, 2015a). Stability analyses considered both circular and non-circular failure surfaces.

2.3.4.3 Sheep Underground Mine

Underground mining would be deferred for up to 5 years after the start of the Congo Pit and it is anticipated that 368,000 tons per year of uranium ore would be mined. The anticipated Sheep Underground Mine sequence is shown in Table 2.3-3.

Table 2.3-3
Sheep Underground Mine Sequence

Year	Extra Mine Spoil (tons)	Intra-Mine Spoil (tons)	Ore (tons)
Development	200,000	0	0
1	90,226	0	99,524
2	162,016	0	223,234
3	0	144,076	430,924
4	0	189,212	385,788
5	0	207,996	367,004
6	0	224,012	350,988
7	0	189,427	385,573
8	0	260,212	314,788
9	0	275,931	299,069
10	0	158,537	416,463
11	0	74,802	224,406
Total	**452,242**	**1,724,205**	**3,497,761**

The lower levels of the existing underground workings were allowed to flood after pumping of groundwater stopped in approximately the year 2000. Accordingly, the Sheep Underground Mine would first be dewatered at an anticipated rate of 750 gpm. Dewatering at a rate of about 250 gpm would be required throughout the life of the mine. After dewatering and investigating the existing mine workings, the existing Sheep I and II shafts, which were constructed as part of earlier mining efforts, would be rehabilitated as necessary for safety purposes to accommodate ventilation and allow for continued dewatering.

The Sheep Underground Mine would include a newly constructed double entry decline (or entry shafts) beginning near the Ore Pad (see Map 2.3-1) and extending below Sheep Mountain for 5,470 feet in length at a grade of 10 percent. These new declines would access the mineralized zones that are too deep to be recovered through Congo Pit operations. A conveyor would be installed in one of the two entries for haulage of ore and waste to the surface.

A modified room and pillar method utilizing large, rubber tired diesel equipment would be employed in mining the underground workings. The mineralized deposit is comprised of 16 stacked mineralized zones with a total thickness of approximately 350 feet. The deposit would be mined primarily from bottom to top as a cut/fill operation. Ore and some waste material would be crushed and placed on a conveyor belt in the decline for transportation to the surface. Two mining schemes would be used in the Sheep Underground Mine, one for development drifts and one for production sections. Development drifts would use a dual opening approach with crosscuts on 100 foot centers. One of the openings would be 12 feet by 12 feet for haulage, and the other opening would be 12 feet by 8 feet for transportation and ventilation. Ramps and vertical raises would be used to connect development drifts for efficient movement of equipment and material.

In production areas, drifts would be advanced into the mineralized pods with multiple entries approximately 12 feet wide and a minimum of 6 feet high with crosscuts on 100-foot centers.

Retreat mining would occur using the same methodology as advance mining, but the pillars between the drifts would be removed by two different methods depending on overlying mineralogy. If the overlying rock contains uranium mineralization, the rooms would be backfilled with waste rock and cement, then the pillars would be excavated. If the overlying rock does not contain mineralization, only temporary support such as timber or concrete cylinders would be placed in the rooms allowing the roof to ultimately collapse.

Because of the nature of the rock at Sheep Mountain, excavation of the declines and mine workings would be completed using both equipment and blasting. Blasting would be completed using ammonium nitrate and fuel oil (ANFO). Jumbo face drilling rigs would drill 8 to 12 foot blast holes that can be filled with ANFO. The blasts would be initiated using a non-electric system with the hole pattern, firing sequence, and delays designed to allow for optimum breakage and minimum ore dilution. Explosives and detonators would be stored in separate underground powder magazines. Blasting operations would be conducted by a certified blasting operator in accordance with MSHA regulations (30 CFR §§ 55, 56, and 57).

Spoils from the Sheep Underground Mine that cannot be replaced within the mined out workings would be removed to the surface and placed in designated spoils piles or replaced as fill in the Congo Pit.

Rock bolts placed on uniform centers with wire mesh would be secured to the roofs and sidewalls by a rock bolting machine during advance mining. Overlap of bolts and wire mesh would provide for proper coverage between each bolt pattern. Ground control and grade control crews, as used within the Congo Pit, would also be used as an integral component of mine operations within the Sheep Underground Mine.

Energy Fuels estimates ventilation requirements in the Sheep Underground Mine at approximately 220,000 cubic feet of air per minute. Two 500-horsepower exhaust fans in the Sheep I and Sheep II shafts would draw air through the dual declines, and multiple portable face fans would direct air through the drifts and working faces to provide adequate air flow for the miners. Additional small diameter vent shafts would also be used, as needed, to provide ventilation.

To aid with ventilation or remove additional ore, boreholes would be drilled using a raised boring machine. Boreholes would be constructed by drilling a small pilot hole from the top then pulling the raised boring machine bit up the hole from the bottom. This process enlarges the borehole and allows cuttings to fall to the bottom for removal.

Primary crushing of ore would also occur within the Sheep Underground Mine, and one of the declines would be used to transport the crushed ore to the surface.

Energy Fuels has the option of extending the existing Big Sheep and Little Sheep Declines to the proposed Sheep Underground Mine to provide for emergency ingress/egress and ventilation. Development of these declines would only occur if ore were processed off-site because construction of the On-Site Ore Processing Facility would make these declines inaccessible and they would be closed. Extension of the existing declines would be similar to the development of the double entry declines as described in Section 2.3.4.3. Waste rock from driving of the declines, if performed, would be transported to the Hanks Draw Spoils Facility. The volume of material would be rather small and have negligible effect on the site mass balance. Therefore, this option has limited effects on the impact analysis presented in Chapters 4 and 5.

2.3.4.4 Equipment

Equipment to be used at the Congo Pit would consist of stripping, mining, and support equipment as summarized in Table 2.3-4. The equipment was selected based on the nature and configuration of the deposit and physical parameters such as the anticipated haulage profile. Because the deposits consist of numerous dipping mineralized horizons, it was determined that both the stripping and mining equipment must not only be efficient but highly selective and flexible. The articulated mine trucks are six-wheel drive units capable of operating in rugged and steep conditions. The twin-engine scrapers can self-load as a pair in a push-pull configuration or can be push loaded with assistance from the track dozers. The smaller self-loading scrapers can excavate in lifts as thin as the cutting edge of the unit, which is approximately 3 inches. For mining, the medium size excavators would be able to excavate in lifts as thin as 6 inches, if needed.

For the Sheep Underground Mine, mining equipment would include drills, rock bolters, scooptrams, haul trucks, and support equipment as summarized in Table 2.3-4. Jumbo drills would be used to drill and blast full development faces while jacklegs would be used in production sections where ore and waste rock may be drilled and blasted separately to maintain adequate grade control. Mucking of the ore and waste would be done using scooptrams. The scooptrams are able to load, haul, and dump mined material and are commonly referred to as LHDs. The LHDs would be used for haulage over shorter distances and would load low-profile underground trucks for longer haul distances. After a face is mucked out, rockbolters would be used to bolt the back (i.e., roof) and ribs (sides) of the opening.

Table 2.3-4
Equipment List

Equipment	Congo Pit Mine	Underground Mine
Major Equipment		
Excavator	2	
Motor Grader	2	
Track Dozer	2	
Mine Haul Truck	2	
Wheel Loader	1	
Twin Engine Scraper	3	
Single Engine Scraper	3	
Self-Loading Scraper	1	
Water Truck (3,000 gallons)	1	
Water Truck (8,000 gallons)	1	
Jumbo Face Drills		5
Jacklegs		12
Rock Bolters		7
Scooptrams		10
Haul Trucks		18
Mine Support Vehicles		
Fuel/lube Truck	1	1
Mechanical Service Truck	1	2
Rubber Tire Backhoe with Forklift Attachment	1	
Pickup Trucks, 4WD, ¾-ton	8	
Powder Buggies		1
Bobcat Skidsteer		2
Utility Truck – Flatbed		1
Scissor Truck		1
Man Trips		6
Forklift		1

Equipment required in the On-Site Ore Processing Facility would include a front-end loader, hydraulic excavator or backhoe, low ground pressure dozer, forklift, crane, pickup trucks, and several all-terrain vehicles (ATVs). This equipment would be relatively small in size and used mainly for loading and unloading of materials, maintenance, and facility inspections. Processing equipment would be contained within the process buildings and include filters, clarifiers, thickeners, mixer-settlers, process and reagent tanks, the vacuum dryer, and associated pumps and piping.

2.3.4.5 Ore Processing (Milling) Operations

Ore from the Congo Pit and Sheep Underground Mine would either be processed at the On-Site Ore Processing Facility (Section 2.3.4.5.1) or shipped off-site for processing at the Sweetwater Mill (Section 2.3.4.5.2).

2.3.4.5.1 On-Site Ore Processing

As noted in Section 2.3, the NRC would be the primary permitting agent for the design, construction, and management of the On-Site Ore Processing Facility. The operation described herein has been discussed with, but not yet approved by, the NRC, and it is included to provide sufficient information for analysis of the potential impacts of the Project addressed in this EIS. As noted at the beginning of Section 2.3, the NRC licensing process would require separate and additional environmental review under NEPA.

For on-site processing, a conveyor would be constructed to transport the ore from the mining areas to the processing facility. Ore would be fed into the hopper/crusher at the front end of the overland conveyor located at the Ore Pad. The conveyer would extend approximately 8,000 feet to the On-Site Ore Processing Facility and would be covered to eliminate spillage and control fugitive dust. As proposed by Energy Fuels, the point at which the conveyor crosses into the NRC License Area delineates the separation between the “mine” and the “ore processing or mill” (see Map 2.3-1).

Once ore is received at the Ore Processing Facility, it would be conveyed to an agglomeration drum where reagents are added to the ore to cause the fine particles to bind together or agglomerate. This is done to improve the flow of leaching solutions through the fine-grained ore. After agglomeration, a stacking conveyor would be used to place the agglomerated ore upon the Heap Leach Pad. Agglomerated ore would be stacked in approximately 12 to 15-foot-high lifts on the pad, with ore placement occurring during the day shift. On the night shift, a 4-inch-thick layer of ¾-inch-diameter gravel would be placed over the daily ore to protect against wind and the generation of fugitive dust.

Leach solution distribution pipes with drip emitters would be placed on top of the gravel layer. Sulfuric acid (H_2SO_4) would be dripped onto the gravel and would percolate through the ore to dissolve uranium into a solution. The uranium-enriched solution would collect in drainage pipes and gravity drain into the Collection Pond for further processing. The solution would then be pumped to the Extraction Plant, or if the uranium concentrations were low, the solution would be reapplied to the Heap Leach Pad for further enrichment.

Recovery of uranium from the enriched solution starts at the Extraction Plant with either an SX or an IX system. In an SX system, the extraction stage is the first in the circuit in which the uranium-enriched solution is mixed vigorously with an organic-based extractant (kerosene with amine extractant and alcohol phase modifier) and solvent carrier using a series of mechanical agitators to remove impurities. After the solution has been mixed, it would be allowed to settle and separate into two phases. The uranium would be concentrated in the organic solution that would float on top of the barren aqueous solution. The uranium-depleted solution, referred to as raffinate, would be recycled into the Raffinate Pond and used as make-up leach solution. The second stage in the SX circuit, the stripping stage, reverses the SX process and strips the uranium from the organic solution by mixing it with high pH solution, which preferentially extracts the uranium from the organic solution. Similar to the first stage, the mixture would be allowed to settle with the uranium now concentrated in the aqueous solution below, and the barren organic solution floating on top. The barren organic solution would be pumped into the barren organic holding tank and re-used in the extraction circuit. Because of the large amount of organics used in the SX building, it would be equipped with a robust fire suppression system.

The IX system would consist of a series of pressurized “down-flow” vessels that are internally screened to maintain ion exchange resin in place while allowing the uranium enriched solution from the Collection Pond to flow through the ion exchange vessels. Once the resin in a vessel becomes loaded with uranium, the vessel would be isolated from the normal process flow and the resin transferred via piping to a separate vessel for elution (i.e., stripping of the uranium and regeneration of the resin).

Both processes (IX or SX) would take place in the same size of building, over the same period of time, and recover the same amount of uranium (depending upon mineralization). Truck trips are not anticipated to change significantly between IX or SX (the Transportation Plan already accounts for a conservative estimate of materials hauling traffic). Either system would be required to meet all applicable standards and regulatory requirements per NRC review and approval. For these reasons, the differences between SX and IX are not anticipated to change the impact analysis as presented in Chapter 4.

After being processed at the Extraction Plant, the uranium-rich solution would be sent to the Precipitation and Packaging Plant for production of U_3O_8 or yellowcake. The production of yellowcake would be accomplished in four major steps: precipitation, washing, drying, and packaging. Washing, drying, and packaging are each contained in separate rooms within the Precipitation and Packaging Plant.

In the precipitation step, the pH of the uranium-enriched solution would be adjusted, as necessary, and hydrogen peroxide (H_2O_2) would be added to precipitate the uranium within a series of tanks. The reagents used in this process would be stored in separate reagent tanks. Precipitated yellowcake solution would then be pumped to a thickener where the precipitate would settle to the bottom and the barren solution would be decanted off the top.

The partially dewatered yellowcake undergoes pressurized water and air filtration to wash impurities and further dewater the yellowcake. After washing, the yellowcake would be collected in a chute and transported on an enclosed conveyor to a zero-emission vacuum dryer. Dried yellowcake would be emptied into a drum under a secured ventilation hood and the loaded drums would be prepared for shipment. The Packaging Plant would have the capacity to store 220 55-gallon USDOT drums, each containing about 900 pounds of yellowcake. Transportation of processed yellowcake is subject to NRC and USDOT regulations. For a schematic of a typical heap leach facility as proposed for the On-Site Ore Processing Facility, see Figure 2.3-5 below.

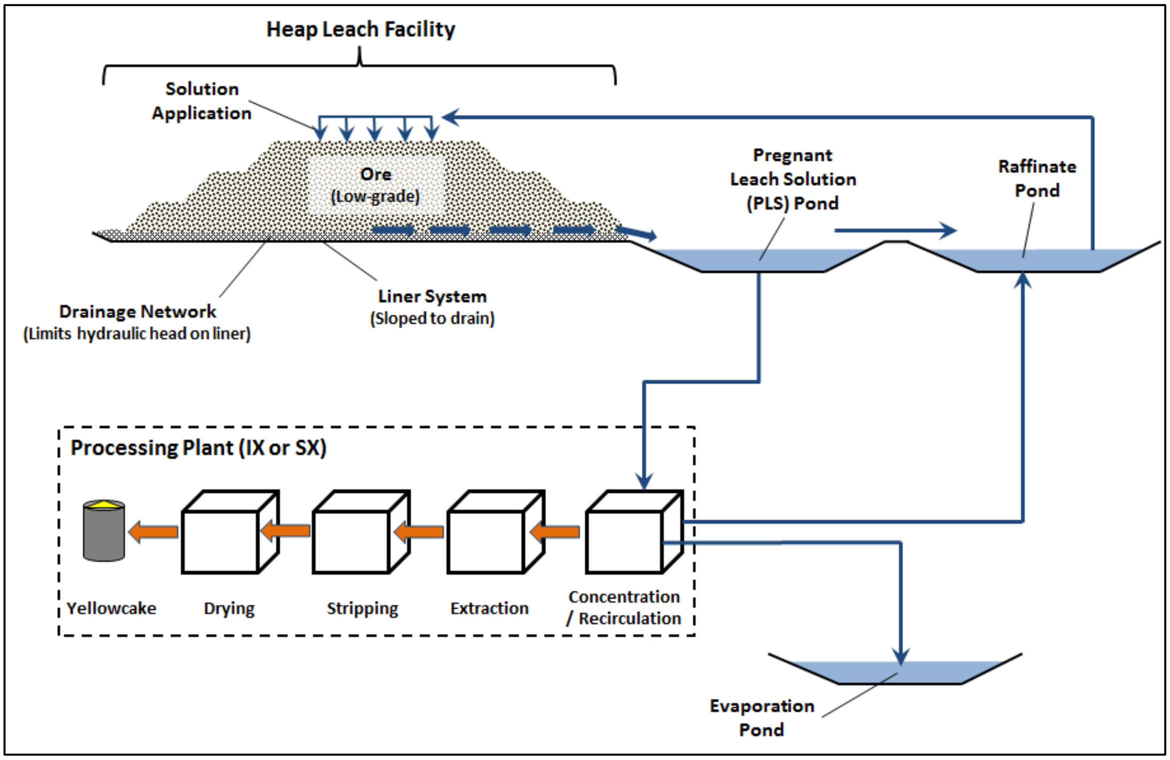


Figure 2.3-5
Typical Heap Leach Schematic

2.3.4.5.2 Off-Site Processing

Energy Fuels has identified the possibility of transporting ore from the mining operations to an off-site facility for processing. Ore would be mined and stockpiled as described above; however, the ore would then be crushed and loaded onto highway-rated trucks for transport to the off-site processing facility. Energy Fuels considers the most likely facility for off-site processing is the existing Sweetwater Mill in Sweetwater County located approximately 33 miles south of the Project Area just east of Crooks Gap/Wamsutter Road on CR 63) and therefore, this is the assumption used for this analysis.

The Sweetwater Mill is located on private lands owned by Kennecott. The BLM is analyzing the Sweetwater Mill because it is a connected action; however, the BLM has no regulatory authority over the mill. Although the mill is currently in stand-by mode, Kennecott holds an active NRC license for operating the mill (License SUA-1350). Production of yellowcake from the Sweetwater Mill could occur under the conditions of the existing license after a pre-operational inspection and after appropriate notification is provided to the NRC. Upgrades, including construction of new evaporation ponds and a tailings impoundment, would be allowed under License SUA-1350.

Ore would be hauled from the Project Area to the Sweetwater Mill using existing county roads (see Map 1.1-1). The Transportation Plan (see Appendix 2-A) describes the current maintenance of access roads that would be used with off-site processing. Energy Fuels would coordinate the maintenance of county roads with Fremont and Sweetwater counties based on county road use, improvement, and maintenance agreements that would be put into effect prior to the start of mining. In addition, Energy Fuels would comply with roadway maintenance agreements in coordination with the Sweetwater Mill. If determined necessary, future widening or upgrades of the existing roads to be used for hauling to the Sweetwater Mill would require future NEPA analysis and permitting actions. This EIS discloses potential impacts associated with hauling ore from the Sheep Mountain Project Area to the Sweetwater Mill assuming no upgrades to the road are necessary. Because the haul routes are along public roadways, the

BLM has no jurisdiction to approve or disapprove of these hauling activities as long as appropriate permits and/or arrangements are made for use and maintenance, therefore, the ROD for this EIS will not include a decision on the transportation of ore along these county roads.

With off-site processing, only mining and initial crushing would occur at the Sheep Mountain Project Area. It is assumed for purposes of this EIS that the disturbance associated with the logistics necessary to transport ore off-site would be within the proposed identified surface disturbance footprint and would be less than the footprint of disturbance identified for on-site processing. Therefore, with off-site processing, the analysis of surface disturbance presented in this EIS would be considered conservative.

The Sweetwater Mill consists of a conventional uranium recovery facility that would take ore hauled from the Sheep Mountain mines and recover uranium as U_3O_8, or yellowcake, for transport to a uranium conversion facility. Ore coming into the Sweetwater Mill would be crushed (if necessary), dissolved into solution using sulfuric acid (H_2SO_4) or other leaching agent, and then be extracted using SX techniques, and precipitated, dried, and packaged using the same processes and procedures as described in Section 2.3.4.5.1 (but using different equipment and process flow with modifications made as necessary). Tailings from the facility (unrecyclable and residual fluids and solids from the dissolution, SX, and precipitation circuits) would be piped to the existing 60 acre tailings impoundment for permanent disposal. Operations and tailings disposal at the Sweetwater Mill is regulated by the NRC under Title 10 CFR § 40, "Domestic Licensing of Source Material." For a map of the existing facilities and approved but not constructed facilities at the Sweetwater Mill see Figure 2.3-6.

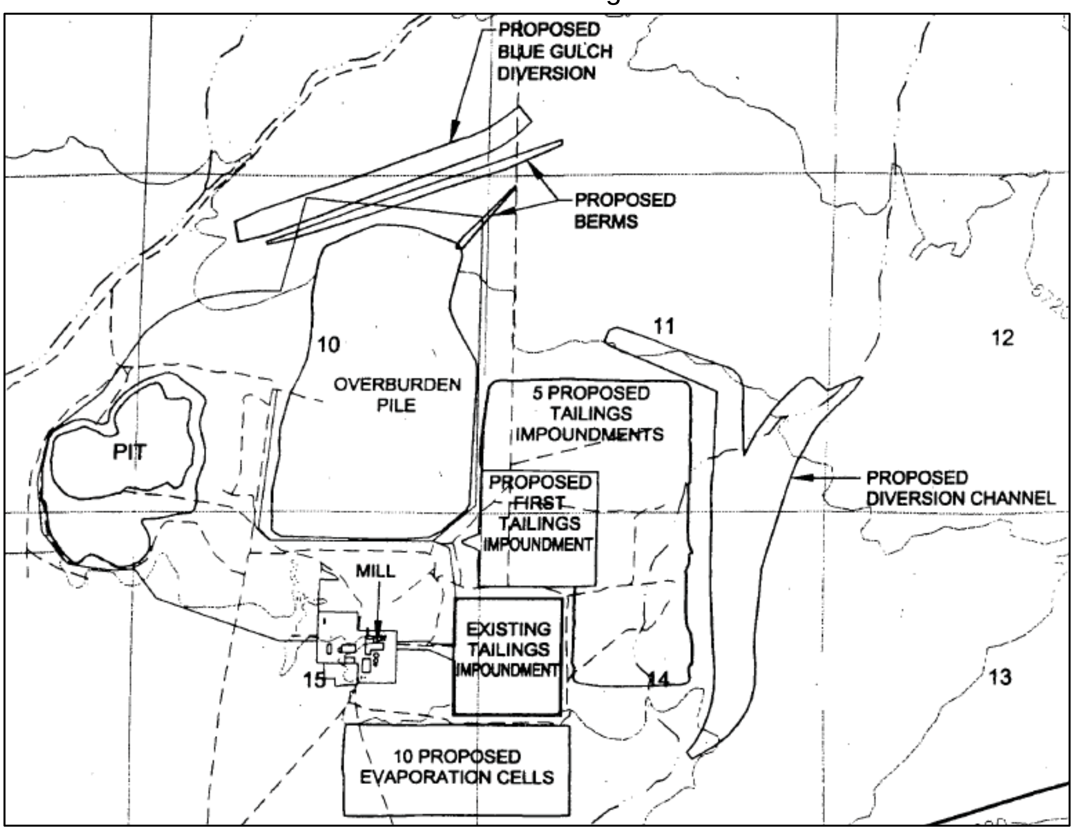


Figure 2.3-6
Sweetwater Project Site Layout

For details into operations and reclamation related to off-site processing at the Sweetwater Mill please see [Source Material License SUA-1350 and associated NRC permitting documents].

2.3.5 Reclamation

2.3.5.1 Overview

Surface disturbance and reclamation would be phased over several years, depending on the uranium production rate, economic conditions, and the availability of mine construction equipment and personnel. As described in the following sections, final reclamation would include: completing the backfill of the Congo Pit with overburden and spoils; plugging and abandoning ventilation shafts and access tunnels; decommissioning and demolishing the facilities and buildings; removing ponds and buried process piping from the processing facility; regrading the surface to approximate original contours; replacing topsoil; and revegetating the disturbed surface with a native plant species approved by the BLM and the WDEQ-LQD.

Normally, the proposed reclamation plan is intended to return the lands disturbed by the Project to approximate original contours and re-establish pre-mine drainage patterns and densities. Because of the historic disturbance at this location, establishing pre-historic mining contours and conditions on all disturbed land would be difficult to achieve. However, the proposed reclamation plan would attempt to reclaim the area previously disturbed into a safer, more natural environment by establishing through-flowing drainages, vegetation, and natural contours. For instance, the Paydirt Pit, as currently reclaimed, includes a closed depression with 4H:1V slopes, but the proposed re-disturbance and subsequent reclamation would backfill the depression in the Paydirt Pit and establish flow-through drainage.

2.3.5.2 Financial Assurance

The financial assurance would address the proposed activities related to mining. With on-site processing, the NRC would require a separate bond to cover the reclamation of the processing site, primarily with respect to radiological decontamination, decommissioning, reclamation of the heap, and long-term care and maintenance for transfer to the State of Wyoming or DOE. Prior to the start of the Project, Energy Fuels would be required to update the reclamation performance bond currently in place for WDEQ-LQD Permit to Mine 381C. The amount would be reviewed and approved by the BLM and the WDEQ-LQD, to cover the costs for a third party to complete the Reclamation Plan of the Mine Permit (mining activities only). Under order of forfeiture, the bond for the mine would be payable to the State of Wyoming or the U.S. Secretary of the Interior (under which BLM operates). The bond amount for the mine would be reviewed annually by the BLM and the WDEQ-LQD and adjusted to reflect changes in cost and in the Project, including Construction and Operation planned for the next year. Once the agencies approve the bond amount, Energy Fuels would submit an irrevocable letter of credit or other approved surety instrument to the WDEQ-LQD, which is the designated agency for holding the bond. Prior to Project approval, the BLM and the WDEQ-LQD will review the bond for adequacy and compliance with the 43 CFR § 3809.555 requirements. Meeting these requirements is consistent with RMP Decision 8008.

2.3.5.3 Congo Pit

Reclamation of the Congo Pit would involve complex spoils management and cut/fill balancing throughout the life of the Project. Table 2.3-2 provides a disturbance and reclamation summary over the life of the Congo Pit. Concurrent backfill methods would be used as much as possible, but final reclamation of most of the pit would not occur until mining is completed. To the extent practical, underground mine spoils would remain underground; however, excess underground mine spoils would be backfilled and reclaimed within the Congo Pit.

The proposed mine sequence includes the stripping and mining of up to 15 contiguous pits within the overall pit limit (see Figure 2.3-2). Working space constraints would require at least some of the mine spoils from the first six pits to be removed and temporarily stockpiled at the surface. Mine spoils generated by the development of Pits 7 through 15 would be backfilled internally. When the Congo Pit reaches its economic limit, 24.5 million cubic yards of spoils previously removed from the pit would be returned to the pit as backfill.

Processed ore (the spent leached material) would not be returned to the pit, resulting in a volume deficit in the Congo Pit of approximately 10 percent. This deficit is expected to be accounted for by the swell factor of the excavated material and by excess spoils from the underground mine.

In addition to topsoil salvage, a minimum of 2 million cubic yards of non-acid forming unclassified earthen material meeting the WDEQ-LQD guidelines for suitability of metals and radionuclides would be salvaged from mine excavations, placed in the South Spoils Facility, and used as a final cover over the mine prior to topsoil placement. While the final reclaimed surface configuration would approximate original contours, the Congo Pit would be located in a rather steep upland area and reclamation would use design criteria developed through geomorphic site investigations completed for the pre-mine conditions. Based on current success with geomorphic mine reclamation techniques that create a diverse and erosionally-stable landscape, as has been demonstrated in the Gas Hills (30 miles north of the Project Area), Energy Fuels proposes that this technique be applied to the Congo Pit mine reclamation (Section 2.3.5.7). After the post-mine topography is created, topsoil would be replaced (Section 2.3.5.8) and the seed mix planted (Section 2.3.5.9).

2.3.5.4 Sheep Underground Mine

Energy Fuels proposes the Sheep Underground Mine to be a cut/fill mine where the majority of mine spoils would be successively backfilled within the mine as ore is removed; therefore, limited out-of-mine spoils would report to the surface. Out-of-mine spoil from the underground mine would consist primarily of material from the initial decline development and additional mine development haulage drifts. It is estimated that the total out-of-mine spoil would be approximately 570,000 cubic yards. Out-of-mine spoils would be stockpiled with the Congo Pit spoils until final reclamation when they would be backfilled within the Congo Pit.

Upon completion of mining, all declines, shafts, and vents (including the Sheep I and II shafts) would be capped and/or sealed by installing a bulkhead. The bulkheads would be at sufficient depth to minimize the potential for mine subsidence to reach the surface. This depth is generally 10 times the mine opening height and would be determined based on the geotechnical factors including the bulking factor and draw angle. The surface disturbances surrounding the shafts would be regraded to approximate original contours (Section 2.3.5.7), topsoil would be replaced (Section 2.3.5.8), and the disturbances revegetated (Section 2.3.5.9).

2.3.5.5 On-Site Ore Processing Facility

Reclamation of the On-Site Ore Processing Facility would increase the disturbance associated with the facility to approximately 205 acres, the majority of which would be located on private lands but would be visible from the Crooks Gap/Wamsutter Road. This increase in disturbance from Construction and Operations is due to the requirements for long-term protection of the 11(e)(2) byproduct materials in the Heap Leach Pad. The reclamation plan for the facility would be reviewed and approved by the NRC in accordance with NUREG-1620 (Standard Review

Plan for the Review of a Reclamation Plan for Mill Tailings Sites), and the State of Wyoming or DOE would manage long-term care and monitoring.

The Extraction Plant, Processing and Packaging Plant, and the Treatment Ponds would require decommissioning. Decommissioning would be conducted in accordance with NRC standards, which include the completion of radiological surveys, contamination control, and segregation of materials requiring disposal. Following surveys, buildings and equipment that do not require further decommissioning would be demolished and all salvageable material recycled. Specialized demolition equipment would be brought to the site to break up the concrete foundations and shred the remaining metal structures and equipment.

Material designated as 11(e)(2) byproduct material from the plant decommissioning, liners from the Treatment Ponds, and any other materials requiring disposal as 11(e)(2) byproduct material would be placed in the designated disposal cell of the Heap Leach Pad prior to final cover and capping. After decommissioning, the disturbed areas where the buildings and ponds were located would be regraded for drainage control, topsoil would be replaced, and the areas revegetated.

Standards described in NUREG 1623 (NRC, 2002) address cover design requirements and long-term erosion stability of the spent heap leach material (the processed ore). When the Heap Leach Pad has reached capacity and spent ore has been rinsed and stabilized, the closure cover would be constructed over the Heap Leach Pad. Final cover placement over the pad would provide approximately 10 feet of cap and final cover material. Based on current practice, the final cap and cover would consist of: a clay radon barrier, a coarse-grained capillary break, a soil cover layer, and an erosion protection layer of riprap and/or soil/rock mulch. Most of these materials are anticipated to be available on-site, but clay and riprap material may need to be imported. The final reclamation cover is designed to use riprap and vegetation for erosion control and create a zero water balance on the surface. The reclaimed heap would have gentle slopes of 6H:1V with a maximum height of 134 feet above the primary liner system.

2.3.5.6 Ancillary Facilities and Monitoring Sites

The conveyor system, site utilities, and buildings (i.e., Administration Office, Sheep Underground Shop/Dry, Mine Shop/Warehouse) would be dismantled or demolished. Materials that can be salvaged or sold would be removed from site for re-use. Concrete pads would be broken into manageable pieces and steel buildings disassembled into manageable pieces. Both types of demolition debris would be placed within the Congo Pit, at least 3 feet below the final reclaimed surface, prior to final grading. Wood and other organic debris would be transported to an approved solid waste landfill for disposal. The disturbances would then be regraded, topsoil would be replaced, and the seed mix would be applied.

Monitoring sites, including wells and SWPPP sites, would be removed or reclaimed once the reclamation of the associated area has been completed and regulatory approval obtained. All monitoring sites would be reclaimed in accordance with applicable requirements, such as well abandonment specifications.

2.3.5.7 Regrading

Surface disturbances related to exploration or other activities outside the mine and ore processing areas would be regraded to approximate original contours and positive surface drainage would be restored. Reclamation of the Congo Pit was designed using Natural Regrade ™ software to create a geomorphically stable and natural appearing reclaimed surface. The

Natural Regrade™ software is designed to increase reclamation potential and decrease erosion. Design features include convex and concave slope profiles, concave channel profiles, a high degree of dissection, multiple small drainage basins, and sinuous channel alignments to increase channel length and decrease gradient.

2.3.5.8 Surface Preparation and Topsoil Replacement

Surface preparation would include spoil sampling prior to topsoil replacement and could include soil amendments to improve the topsoil viability or ripping of the subsurface materials to reduce compaction. Prior to topsoil placement, regraded surfaces and available topsoil would be inspected and/or sampled as necessary to determine the need for amendments, such as agricultural lime or fertilizer. Lime would only be necessary where the materials at the final regraded surface exhibit the potential to develop acidic conditions. This is considered unlikely based on previous overburden analysis and proposed materials handling techniques. If needed, application rates would be determined by sampling of the rough graded surface. Application equipment would be specifically designed for such work and operated by experienced personnel. Once applied, agricultural lime would be incorporated into the regraded surface by discing within 12 hours of application. Fertilizer rates would be determined by sampling of the available topsoil. Fertilizer would be broadcast by equipment specifically designed for application of granular fertilizer. Typically a 2:1:1 (Nitrogen (N): Phosphorus (P): Potassium (K)) fertilizer would be applied at the specified rate.

If a surface area is compacted, the area would be ripped to relieve compaction to a minimum depth of 12 inches in the subsoil, enhancing root penetration. Ripping would parallel the contour at intervals sufficient to "shatter" compacted materials between rip lines on a single pass of the ripping equipment.

Suitable subsoil and topsoil placement would be conducted directly after finish regrading and surface preparation. Once ripping and/or topsoil placement is complete, no equipment traffic, other than as necessary for completion of revegetation, would be allowed over these areas. Topsoil would be placed in an incremental manner to limit haulage over previously placed topsoil. Scrapers would be the primary equipment used to place topsoil with assistance from a dozer and/or motor grader.

Suitable subsoil would be placed at an average thickness of 12 inches, with topsoil placed at a minimum thickness of 6 inches. Isolated areas with difficult terrain may have varied thicknesses of subsoil and topsoil replaced, with a minimum of 6 inches. The topsoil would be disced in preparation for seeding on slopes shallower than 3H:1V. Benefits of contour ripping/discing include precipitation concentration within the small depressions, creation of a protected environment for the seeds, and disruption of flow paths on slopes.

2.3.5.9 Revegetation

The revegetation method proposed for steeper areas, greater than 3H:1V, is broadcast seeding while contour ripping/discing and drill seeding is proposed for less steep areas (i.e., less than 3H:1V). The specified seed mix would be uniformly distributed with a mechanical device specifically designed for such work and the ground thoroughly raked or dragged immediately after seeding to cover the seed with approximately one-quarter inch (0.25-inch) of soil. Raking or dragging would be performed parallel to the contour. Broadcast seeding with raking or dragging would be performed in ditch and channel flowline areas.

Energy Fuels has proposed using the seed mixes presented in Table 2.3-5 (Broadcast Seed Mixture) and Table 2.3-6 (Drill Seed Mixture) for increased diversity. The application rate for broadcast seeding is approximately twice that of drill seeding due to the reduced success of broadcast seeding. Fall seeding would be completed between September 15th and the time that frost prevents preparation of a proper seed bed. Spring seeding would be performed after the frost leaves the ground and until May 15th.

Table 2.3-5
Broadcast Seed Mixture

Seed Mixture Species	**Pure Live Seed Pounds/Acre**
Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), "Critana"	6.5
Bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), "Secar"	4.5
Western wheatgrass (*Pascopyrum smithii*), "Rosana"	4.5
Slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), "Pryor"	4.5
Needle and thread grass (*Stipa comata*)	1.0
Indian ricegrass (*Achnatherum hymenoides*), "Nezpar"	2.0
Sainfoin (*Onobrychis vicaefolia*), "Eski"	0.5
Wyoming big sage (*Artemesia tridentata wyomingensis*)	0.5
Scarlet globemallow (Schaeralcea coccinea)	0.25
Western yarrow (*Achillea millefolilum var. occidentalis*)	0.25
Fourwing saltbush (*Atriplex canescens*)	2.0
Total	**26.5**

Table 2.3-6
Drill Seed Mixture

Seed Mixture Species	**Pure Live Seed Pounds/Acre**
Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), "Critana"	3.25
Bluebunch wheatgrass (*Pseudoroegneria spicata ssp. spicata*), "Secar"	2.25
Western wheatgrass (*Pascopyrum smithii*), "Rosana"	2.25
Slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), "Pryor"	2.25
Needle and thread grass (*Stipa comata*)	0.5
Indian ricegrass (*Achnatherum hymenoides*), "Nezpar"	1.0
Sainfoin (*Onobrychis vicaefolia*), "Eski"	0.25
Wyoming big sage (*Artemesia tridentata wyomingensis*)	0.5
Scarlet globemallow (*Schaeralcea coccinea*)	0.1
Western yarrow (*Achillea millefolilum var. occidentalis*)	0.1
Fourwing saltbush (*Atriplex canescens*)	0.25
Total	**12.7**

2.3.5.10 Interim Mine Stabilization

The BLM and WDEQ-LQD would require interim reclamation plans (also called interim mine stabilization or interim management plans) and would be notified immediately if operations were to cease for an extended period of time. Energy Fuels would manage the facility during periods of temporary closure in a manner similar to that during Operations. The basic elements of an interim reclamation plan for this Project are outlined below, and any plan submitted to the agencies for review and approval would require identification of the reason(s) for the temporary cessation of the Project.

Should interim cessation of mining and/or mineral processing be necessary, the operation would not immediately shutdown, but operations would proceed in an orderly manner to achieve site stabilization. It is likely that mineral processing would continue even if mine operations shut down for a period of time, because recovery of uranium oxide would still be possible from the stockpiled ore. It is possible that ore could be received from other mine operations; however, this would require further NEPA analysis separate from this EIS. Roads, stockpile areas, buildings, and facilities within the Project Area necessary to allow for the eventual restart of mining would be identified and preserved. All areas requiring stabilization would be identified, and stabilization procedures would be developed (seeding, reclamation, backfilling, slope stabilization, safety fencing, etc.). Any stored fuel, lubricants, or chemicals would be removed from the site and used at another project or recycled or disposed of at a licensed facility. The mining of any exposed ore would be completed, and the ore would be transferred to the On-Site Ore Processing Facility for processing and/or stabilization or would be shipped to a licensed off-site processing facility.

Active leaching operations at the Heap Leach Pad would be completed. Equipment, tanks, and interior surfaces in the process buildings would be decontaminated and cleaned. Solids would be removed from the Raffinate Pond, Collection Pond, and Holding Pond. Liners from the ponds would be cleaned using high-pressure water sprays. Fuel, reagents, and other chemical storage on-site would be drained and stabilized. Any wastes generated by the decontamination and cleanup process would be disposed of within the Heap Leach Pad, stabilized, and covered. The On-Site Ore Processing Facility, including the pad, ponds, and the buildings would be secured from public access. Site security would be maintained by physical presence and/or remote surveillance.

Energy Fuels would conduct monthly inspections of the Project Area. If an inspection were to discover any breach in the infrastructure, it would be immediately reported, and remedial action would proceed, pending approval from the respective regulatory authority. Environmental monitoring for ground and surface waters, radiological levels, and air particulates would be conducted at the required frequencies. Reclamation bonds would remain in place with the designated agencies to ensure ultimate reclamation of the Project.

2.3.5.11 Evaluation of Reclamation Success

After reclamation of the areas disturbed as part of the Project, the areas would be monitored and the reclamation bond would remain in place until such time that all reclamation conditions of the WDEQ-LQD Permit to Mine 381C and BLM requirements have been met; including, but not limited to: establishment of vegetation; stabilization of the site with respect to erosion; and that the groundwater quantity and quality is consistent with the requirements of the WDEQ-LQD Permit to Mine 381C. Some site maintenance would likely be required during the monitoring period. This may include reseeding of areas with poor vegetation, erosion repairs, replacement/cleaning of sediment controls, and maintenance of gates and fencing. Once all permit conditions have been met, Energy Fuels would request release of the reclamation bond and termination of jurisdiction from the WDEQ-LQD and the BLM.

Closure of the On-Site Ore Processing Facility would be managed as outlined in the following section.

2.3.5.12 Post-Closure Management of the On-Site Ore Processing Facility

Once decommissioning, reclamation, and closure of the On-Site Ore Processing Facility are complete and NRC requirements are met, title to all or part of the NRC License Area would be transferred to the State of Wyoming or DOE for long-term care and maintenance (DOE, 2012). Prior to title transfer, and termination of the NRC License, the NRC and the receiving agency would complete a plan for the long-term care, and at the time of transfer, Energy Fuels would also provide funding for continued care and maintenance. The majority of the processing site to be transferred to the State of Wyoming or DOE would be located on private surface with a portion of the reclamation area on BLM surface (approximately 90 acres). However, the area has a split mineral estate administered by the BLM and this area would be withdrawn from mineral development in accordance with the applicable rules and regulations such as; Title 43 CFR § 2091.5-Withdrawals (see Map 2.3-2). The title transfer would also address easements, rights-of-way, and other property rights.

2.3.5.13 Exploration Drilling

Energy Fuels would continue to conduct exploration drilling to identify additional mineral resources and reserves within the Project Area as needed. Energy Fuels has existing permits to conduct exploration and disturbance resulting from exploration would be reclaimed to appropriate standards as soon as feasible after drilling.

2.3.6 Schedule

The Project schedule is dependent on several factors including permitting and licensing as well as the uranium market and available financing. The Sheep Mountain Uranium Project would be constructed under a staggered development schedule. The surface mine (Congo Pit) would be developed sequentially to accommodate the desired mine production and allow for internal backfilling. Development of the underground mine would be deferred for up to 5 years after surface mining commences. If a processing facility is built in the Project Area, its construction is expected to begin 6 months prior to development of the Congo Pit. If Sheep Mountain ore is processed at the Sweetwater Mill, any necessary construction and rehabilitation is expected to begin 3 months prior to development of the Congo Pit.

Based on currently identified resources, the Congo Pit would operate for approximately 8 years, and the Sheep Underground Mine would have a mine life of approximately 11 years. Ore processing would continue for a number of years after the mines are closed. Reclamation of the mines and associated facilities would commence immediately after mine closure, and reclamation of the processing facility would commence as soon as processing is completed. The overall project life is anticipated to be 20 years from initial construction to completion of final reclamation. The project schedule is not anticipated to change with off-site processing.

Energy Fuels proposes operating 2 to 3 shifts per day, 5 to 7 days per week, to complete Construction and Operation. This schedule could be modified if market conditions or other considerations warrant a change. The On-Site Ore Processing Facility would operate on three daily shifts (8 hours per shift), 7 days per week, and 365 days per year.

2.3.7 Workforce

Total workforce requirements are shown below in Tables 2.3-7 through 2.3-12. Because the Project Area is located in a remote portion of southwest Fremont County, Energy Fuels expects that the Project would attract workers from surrounding rural areas and towns, including Riverton (62 miles), Lander (57 miles), Jeffrey City (8 miles), and Rawlins (67 miles). Some workers could also commute to the Project Area from Casper (105 miles). Given the relatively long distances between the Project Area and population centers, the local workforce is defined to include workers from Fremont and Carbon counties, and the non-local workforce is defined to include workers who live in other counties (and states). Non-local construction workers would be expected to temporarily relocate to Fremont County for the duration of their employment period. Non-local operational workers would be permanent employees and would be expected to relocate to either Fremont or Carbon counties.

Mine personnel would complete safety training as required by MSHA and State Mine Inspection Office. Personnel in the On-Site Ore Processing Facility would complete industrial safety training as required by the Occupational Safety and Health Administration (OSHA) and radiological safety training as required by the NRC. Personnel and visitors would wear PPE in areas where required. Radiometric scanning would be conducted on all personnel and visitors entering or exiting the On-Site Ore Processing Facility. Personnel within the NRC Restricted Area would wear individual monitors and/or badges.

2.3.7.1 Construction

On-Site Processing

During the Construction phase, approximately 20 workers would be required to construct the Congo Pit and associated mine facilities (e.g., ore stockpile, diversion channels, and sediment and collection ponds). The Congo Pit would not require a large volume of topsoil stripping (due to historic disturbance); therefore, these construction personnel would also operate the Congo Pit. Approximately 50 workers would be required to construct the new workings for the Sheep Underground Mine (see Table 2.3-7). The Congo Pit and Sheep Underground Mine would not be constructed simultaneously. As noted in Section 2.3.6, Energy Fuels expects that construction of the Sheep Underground Mine would be deferred for up to 5 years following the start of open pit mining operations. Approximately 110 workers would be required to construct the On-Site Ore Processing Facility, including the Heap Leach Pad. Approximately 100 of these workers would be contractors and 10 would be quality control personnel.

Table 2.3-7
Sheep Mountain Construction Workforce with On-Site Processing[1]

Project Component	Duration	# of workers
Congo Pit	2-4 months	20
Sheep Underground Mine	18 months	50
On-Site Ore Processing Facility	9 months	110
	Total	**180**
[1] Source: Energy Fuels, 2015a.		

Energy Fuels expects that local workers would comprise approximately 50 percent of the Construction workforce required to construct the Congo Pit and associated mining facilities. Approximately 50 percent of the Construction workforce for the Sheep Underground Mine is also expected to consist of local workers. Pre-engineered building and siding suppliers would mobilize company ironworkers, sheet metal installation crews, mobile crane operators, man- and forklift operators, and welders to construct the buildings. Smaller, local contractors would be used to supply materials, perform earthwork, and construct the smaller buildings.

Both general and specialized contractors would be required to construct the On-Site Ore Processing Facility. A general contractor experienced in mill construction would be hired to build most of the facility and specialized contractors would be contracted to erect the larger tanks, install the liners, and construct the overland conveyor. Energy Fuels would encourage its contractors to review, qualify, and employ as many skilled and unskilled workers from the local area as possible; however, Energy Fuels expects that the construction workforce for the processing facility would consist of approximately 30 percent local workers and 70 percent non-local workers.

Off-Site Processing.

With off-site processing, construction personnel in the Project Area would include 70 workers to construct the Congo Pit and Sheep Underground Mine (see Table 2.3-8). Although construction personnel for the Sweetwater Mill are not included in the workforce estimates for the Proposed Action, Energy Fuels anticipates that approximately 55 workers would be required for approximately 6 months to construct and refurbish facilities at the Sweetwater Mill (WDEQ, 2015a).

Table 2.3-8
Sheep Mountain Construction Workforce with Off-Site Processing[1]

Project Component	Duration	# of workers
Congo Pit	2-4 months	20
Sheep Underground Mine	18 months	50
	Total	**70**

[1] Source: Energy Fuels, 2015a.

2.3.7.2 Operations

On-Site Processing

Energy Fuels expects that the workforce associated with mining operations would include approximately 169 mining personnel (see Table 2.3-9). Most of these workers would be full-time employees, but some contractors would be required. During operation of the Congo Pit, the number of miners required would increase from the 20 needed during pit construction to the full operational workforce of 41 miners. Energy Fuels expects that many of the workers hired to construct the Sheep Underground Mine would remain during mining operations and that the underground mining workforce would increase to 128 miners. Operation of the Heap Leach Pad and On-Site Ore Processing Facility would require approximately 35 workers. The Congo Pit and Sheep Underground Mine workforces are expected to consist of approximately 50 percent local workers and 50 percent non-local workers. The workforce for the Heap Leach Pad and On-Site Ore Processing Facility is anticipated to include approximately 35 percent local workers and 65 percent non-local workers.

Table 2.3-9
Sheep Mountain Operational Workforce with On-Site Processing[1]

Project Component	Duration	Number of Workers
Congo Pit	8 years	41
Sheep Underground Mine	11 years	128
On-Site Ore Processing Facility	12 to 16 years	35
	Total	**204**

[1] Source: Energy Fuels, 2015a.

Off-Site Processing

If ore is processed off-site, operational personnel in the Project Area would include 169 workers at the Congo Pit and Sheep Underground Mine, and up to 15 truck drivers hauling ore from the Project Area to the Sweetwater Mill (see Table 2.3-10). Local workers are expected to account for all ore haul truck drivers. Although operational personnel for the Sweetwater Mill are not included in the workforce estimates for the Proposed Action, Energy Fuels expects that approximately 120 workers would be required to process ore at the Sweetwater Mill (WDEQ, 2015a).

Table 2.3-10
Sheep Mountain Operational Workforce with Off-Site Processing

Project Component	Duration	Number of Workers
Congo Pit[1]	8 years	41
Sheep Underground Mine[1]	11 years	128
Ore Haul Truck Drivers[2]	12 to 16 years	15
	Total	**184**

Sources:
[1] Energy Fuels, 2015a.
[2] Sheep Mountain Transportation Plan (Appendix 2-A). This estimate assumes that ore would be produced at both the Congo Pit and Sheep Underground Mine. Initially, fewer ore haul truck drivers would be required as ore production would be limited to the Congo Pit.

2.3.7.3 Reclamation

On-Site Processing

Reclamation would require fewer employees than Construction or Operations. With an On-Site Ore Processing Facility, the final reclamation workforce would include approximately 54 workers (see Table 2.3-11). The majority of the mining reclamation would be concurrent with mining, so employees working at the Congo Pit and Sheep Underground Mine would complete most of the reclamation during mining. Larger equipment could be utilized during reclamation to reduce costs and shorten the Reclamation phase. The Reclamation workforces for the Congo Pit, Sheep Underground Mine, Heap Leach Pad, and On-Site Ore Processing Facility are expected to consist of approximately 50 percent local workers and 50 percent non-local workers.

Table 2.3-11
Sheep Mountain Reclamation Workforce with On-Site Processing[1]

Project Component	Duration	Number of Workers
Congo Pit	5 years	24
Sheep Underground Mine	1-2 years	6
On-Site Ore Processing Facility	2-3 years	24
	Total	**54**

[1] Source: Energy Fuels, 2015a.

Off-Site Processing

If ore is processed off-site, final reclamation activities in the Project Area would include 30 workers to close and reclaim the Congo Pit and Sheep Underground Mine (see Table 2.3-12). Although reclamation personnel for the Sweetwater Mill are not included in the workforce estimates for the Proposed Action, Energy Fuels estimates that approximately 24 workers would be required during closure and final reclamation of the Sweetwater Mill (Energy Fuels, 2015a).

Table 2.3-12
Sheep Mountain Reclamation Workforce with Off-Site Processing[1]

Project Component	Duration	Number of Workers
Congo Pit	5 years	24
Sheep Underground Mine	1-2 years	6
	Total	**30**

[1] Source: Energy Fuels, 2015a.

2.3.8 Traffic

Traffic estimates associated with the Proposed Action are shown below in Tables 2.3-13 through 2.3-18. Traffic and access are described in detail in the Transportation Plan (see Appendix 2-A). Given the Project Area's remote location and the existing network of regional roads, workers are expected to live in surrounding rural areas and in the towns of Riverton, Lander, Jeffrey City, and Rawlins. At this time, Energy Fuels does not have definitive plans to provide bussing for employees; however, it might be considered during Operations. Carpooling is anticipated given the remote location of the Project Area.

2.3.8.1 Construction

On-Site Processing

Traffic related to construction of the On-Site Ore Processing Facility is estimated to include between 40 and 61 vehicle round-trips per day during the first 6 months of project development. Construction of the processing facility would overlap with construction at the Congo Pit for approximately 3 months in Year 1, when construction traffic would include between 48 and 71 vehicle round-trips per day (see Table 2.3-13). Construction of the Sheep Underground Mine would include between 18 and 25 vehicles for approximately 18 months sometime after Year 1.

Table 2.3-13
Sheep Mountain Construction Traffic with On-Site Processing
(estimated vehicle round-trips per day)

Project Component	Project Schedule	Light Vehicles	Heavy Vehicles	Total Vehicles
On-Site Ore Processing Facility	9 Months in Years 0 - 1	35 - 55[5]	5 - 6[2, 6]	40 - 61
Congo Pit	12 months in Year 1	8 -10[1]	0[2]	8 - 10
Sheep Underground Mine[3]	18 Months after Year 1	18 - 25[4]	0[2]	18 - 25

Assumptions:
[1] Assumes that between 15 and 20 workers are required to construct the Congo Pit. Vehicle estimates include workers' personal vehicles, assuming two workers per vehicle.
[2] Assumes that heavy equipment remains on-site during construction.
[3] Construction of the Sheep Underground Mine would be deferred for up to 5 years depending on financing and market conditions.
[4] Construction of the Sheep Underground Mine would include between 15 and 30 workers to drive the double-entry decline and 20 workers to conduct rehabilitation in the mine. Vehicle estimates include workers' personal vehicles, assuming two workers per vehicle.
[5] Includes personal vehicles for 70 to 110 processing facility construction workers, assuming two workers per vehicle.
[6] Includes 302 truckloads of materials delivered between 135 and 270 days. Assumes that durable rock material is obtained off-site.

Off-Site Processing

If ore is transported to the Sweetwater Mill for processing, construction traffic to the Project Area would include between 8 and 10 vehicle round-trips per day for the Congo Pit and between 18 and 25 vehicle round-trips per day for the Sheep Underground Mine (see Table 2.3-14). Additional traffic would result from construction and refurbishment of the Sweetwater Mill.

Table 2.3-14
Sheep Mountain Construction Traffic with Off-Site Processing
(estimated vehicle round-trips per day)[1]

Project Component	Project Schedule	Light Vehicles	Heavy Vehicles	Total Vehicles
Congo Pit	12 months in Year 1	8 -10	0	8 - 10
Sheep Underground Mine	18 Months after Year 1	18 - 25	0	18 - 25

[1] See assumptions noted in Table 2.3-13.

2.3.8.2 Operations

On-Site Processing

Traffic related to operation of the On-Site Ore Processing Facility is expected to include between 55 and 107 vehicle round trips per day. The lower estimate assumes that the Project is operating at less than full capacity with partial workforce levels and the upper estimate assumes that the Project is operating at full capacity with peak workforce levels. Operational traffic would be highest sometime after Year 1, when the Congo Pit and Sheep Underground Mine would both be operating. Prior to that time, operations-only traffic would include between 23 and 43 vehicle round-trips per day (see Table 2.3-15).

Table 2.3-15
Sheep Mountain Operational Traffic with On-Site Processing
(estimated vehicle round trips per day)

Project Component	Light Vehicles	Heavy Vehicles	Total Vehicles
On-Site Ore Processing Facility	10 - 18[4]	3 - 4[5]	13 - 22
Congo Pit	10 - 21[1]	0[2]	10 - 21
Sheep Underground Mine	32 - 64[3]	0[2]	32 - 64

Assumptions:
[1] Includes personal vehicles for between 20 and 41 Congo Pit workers, assuming two workers per vehicle.
[2] Assumes that mine support vehicles, water trucks and mechanical service trucks remain on-site.
[3] At full production, the Sheep Underground Mine is expected to employ 128 workers over two shifts. Lower production levels may require only one daily work shift. The estimated vehicle range includes personal for between 64 and 128 underground mine workers and assume two workers per vehicle.
[4] Includes personal vehicles for 20 to 35 processing facility workers, assuming two workers per vehicle.
[5] Includes approximately one yellow cake shipment per week, one delivery of sodium chlorate per week, nine shipments of sulfuric acid per week, two shipments of miscellaneous chemicals (sodium carbonate, hydrogen peroxide, sodium hydroxide, hydrated lime) per week, one fuel delivery per day, and two shipments per week of domestic solid wastes to the Jeffrey City Transfer Station.

Off-Site Processing

If Sheep Mountain ore is processed at the Sweetwater Mill, operational traffic is estimated to include between 49 and 100 vehicle round-trips per day to the Project Area (commuting workers) and between 36 and 81 vehicle round-trips per day to the Sweetwater Mill (ore haul trucks), for a total of 85 to 181 vehicle round-trips per day (see Table 2.3-16). During the Project's early years, when only the Congo Pit would be producing ore, total operational traffic would include approximately 64 vehicle round-trips per day. Additional traffic, primarily related to commuting workers, would occur during operations at the Sweetwater Mill.

Table 2.3-16
Sheep Mountain Operational Traffic with Off-Site Processing
(estimated vehicle round trips per day)

Project Component	Light Vehicles	Heavy Vehicles	Total Vehicles
Congo Pit[1]	10 - 21	0	10 - 21
Sheep Underground Mine[1]	32 - 64	0	32 - 64
Ore Haul Trucks	7 – 15[2]	36 – 81[3]	43 – 96

Assumptions:
[1] See assumptions noted in Table 2.3-15.
[2] Includes personal vehicles for between 7 and 15 ore haul truck drivers.
[3] Assumes between 7 and 15 haul trucks make up to five round trips per day between the Project Area and the Sweetwater Mill. Assumes that haul trucks remain on-site when not in use.

2.3.8.3 Reclamation

<u>On-Site Processing</u>

Traffic associated with final reclamation of the Congo Pit would include between 10 and 12 vehicle round-trips per day. Final reclamation of the Sheep Underground Mine and ore processing facility would occur after the closure of the Congo Pit, and would include between 22 and 27 vehicle round-trips per day (see Table 2.3-17).

Table 2.3-17
Sheep Mountain Reclamation Traffic with On-Site Processing
(estimated vehicle round trips per day)

Project Component	Light Vehicles	Heavy Vehicles	Total Vehicles
Congo Pit	10 - 12[1]	0[2]	10 - 12
Sheep Underground Mine	2 - 3[3]	0[2]	2 - 3
On-Site Ore Processing Facility	10 - 12[4]	10 - 12[5]	20 - 24

Assumptions:
[1] Includes personal vehicles for between 20 and 24 reclamation workers, assuming two workers per vehicle
[2] Assumes that heavy vehicles required for mine reclamation remain on-site.
[3] Includes personal vehicles for four to six reclamation workers, assuming two workers per vehicle.
[4] Includes personal vehicles for between 20 and 24 reclamation workers, assuming two workers per vehicle.
[5] Assumes that materials for the radon barrier (i.e., clay), riprap and other durable rock layers are sourced off-site.

<u>Off-Site Processing</u>

If Sheep Mountain ore is processed at the Sweetwater Mill, traffic during final reclamation of the Congo Pit would include between 10 and 12 vehicle round-trips per day. Traffic during final reclamation of the Sheep Underground Mine would include between 2 and 3 vehicle round-trips per day (see Table 2.3-18). Additional traffic would result from final reclamation of the Sweetwater Mill.

Table 2.3-18
Sheep Mountain Reclamation Traffic (estimated vehicle round trips per day) [1]

Project Component	Light Vehicles	Heavy Vehicles	Total Vehicles
Congo Pit	10 - 12	0	10 - 12
Sheep Underground Mine	2 - 3	0	2 - 3
[1] See assumptions noted in Table 2.3-17.			

2.3.9 Transportation

Transportation to and from the mine and processing facility, regardless of whether the processing facility is on- or off-site, is subject to USDOT regulations, including requirements for a spill response plan when shipping hazardous materials. Transportation of radiological materials also must meet NRC regulations (10 CFR § 71). Personnel would commute to and from the Project Area from Riverton, Lander, Jeffrey City, or Rawlins on a daily basis. Deliveries to the Project Area would include diesel fuel, equipment and spare parts, explosives for the mine, potable water, and potentially, chemicals for ore processing.

Energy Fuels estimates weekly shipments of yellowcake from the processing facility, whether on- or off-site, using a 25 ton capacity tractor-trailer, typically carrying 43 drums of yellowcake. The drums would be packed tightly using wooden cribbing to prevent shifting of the load during transport. The transport trucks would be licensed and insured to transport low-level radioactive material. The yellowcake would likely be transported to the ConverDyn enrichment facility located in Metropolis, Illinois or the Cameco facility in Port Hope, Ontario, which are about 1,300 and 1,750 miles (respectively) from the on-site and off-site processing facilities. With off-site processing, haulage traffic would also be required to transport ore from the Project Area to the Sweetwater Mill (see Appendix 2-A, Transportation Plan). Additional traffic from the Project Area would include routine solid waste disposal at the nearest landfill. For details concerning additional traffic related to processing at the Sweetwater Mill, see Source Material License SUA-1350 and associated NRC permitting documents.

Within the Project Area, almost all new roads would be constructed on spoils from the Congo Pit or Sheep Underground Mine. The only new roads would include: extension of the existing access road from the Crooks Gap/Wamsutter Road to the mine; the road through the Congo Pit from the Ore Pad to the Hanks Draw Spoils Facility; temporary roads to topsoil stockpiles, various secondary roads around the Congo Pit; and if the On-Site Ore Processing Facility is constructed, a section of road from the facility to the mine and secondary roads within the facility.

Roads would be constructed using sandy gravel produced on-site or from an outside source. The material would pass a 3/8-inch screen. Roads would be crowned and ditched with a maximum width of 60 feet allowing for two-way heavy equipment traffic. Culverts would be installed to convey runoff from all first and second order drainages that might be crossed. Full time maintenance of on-site roads would be performed using a motor grader, and a water truck would be used for dust control.

2.3.10 Waste Management

Wastes generated would include liquid and solid wastes, including wastes classified as 11(e)(2) byproduct materials by the NRC. Spill contingency plans are discussed first, and then the liquid and solid waste management plans are discussed. For details into spill contingency related to off-site processing at the Sweetwater Mill, see Source Material License SUA-1350 and associated NRC permitting documents.

2.3.10.1 Spill Contingency Plans

Energy Fuels' spill contingency plans for mine operations, ore processing, and transportation are described below.

Mine Operations

Daily mine operations use a variety of fuels and lubricants as well as antifreeze and other chemicals. The fuel and lubricant storage pads would be enclosed within berms capable of containing any spill from tanks plus adequate freeboard (generally 2 to 5 feet depending on pond size). The pad and berm would be constructed of compacted clay amended soil, a synthetic liner, and/or a geosynthetic clay liner (GCL). Mine shops and warehouses would be equipped with drain and waste containment sumps to contain any spills. Solvent stations used for cleaning parts would recycle the solvent back to a drum or tank. All spilled fuels and waste from lubricant and solvent stations would be recycled and/or disposed of off-site at a licensed facility.

Ore Processing

The on-site ore processing buildings and storage tanks would be equipped with concrete containment walls and sumps to contain spills, leaks, and periodic equipment wash down water. Fueling and lubricant stations within the processing area would be contained in berms similar to those described for the mine operations; however, concrete walls may also be used given the more permanent nature of the processing facility.

The On-Site Ore Processing Facility, including the Heap Leach Pad, is designed to contain all flows and spills and the PMP event as described in Section 2.3.3.7.2. The Heap Leach Pad is designed with a positive drain and collection system which first drains to the Collection Pond (see Figure 2.3-1). Any spill not contained in the processing buildings, even in the event of complete loss of power, would gravity drain to the Raffinate Pond, which in turn would overflow into the Collection Pond under extreme conditions. Finally, the Collection Pond is designed with an overflow to the Holding Pond and has sufficient design capacity for all operational solutions and containment of the PMP over the entire On-Site Ore Processing Facility, including an allowance for freeboard and potential wave action (generally 2 to 5 feet).

Transportation

Transportation along public roads both to and from the mine and the ore processing facilities (either an on-site facility or off-site facility) would be subject to USDOT regulations including the requirements for a spill response plan when transporting hazardous materials (e.g., fuel, chemical reagents, explosives, and yellowcake). Transportation along public roads both to and from the mine and the ore processing facility would be subject to the NRC's regulations as well; however, the NRC does not require by regulation a spill response plan. Material transportation to the Project would primarily involve diesel fuel, consumable items such as chemical reagents for ore processing, underground mine materials, explosives, equipment, and spare parts.

Materials transportation from the Project would primarily consist of yellowcake, which is a solid product packaged in USDOT-approved 55 gallon drums for shipment.

2.3.10.2 Liquid Waste Management

The Project would generate several different types of liquid wastes, including: stormwater runoff, domestic liquid waste, waste petroleum products and chemicals, native groundwater, and processing waste (11(e)(2) byproduct material).

Stormwater Runoff

Energy Fuels has an active and current SWPPP that would be updated through the WDEQ-LQD Permit to Mine 381C as necessary to accommodate for the proposed mining and processing. Surface water management practices would control runoff in accordance with state and federal regulations. Construction of the Congo Pit and associated spoils facilities would require extensive surface water control – a system of diversions, sediment ponds, and collection ponds, which are described in detail below in Section 2.3.11.1 and in Sections 3.7 and 3.9.2.3 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). Straw wattles, sediment fencing, sediment ponds, and other typical BMPs would also be used in smaller disturbance areas to limit erosion and sediment transport from the site.

Domestic Liquid Waste

For the mining portion of the Project, only domestic liquid waste, essentially sanitary sewage, which can be disposed of in a septic system permitted by the Fremont County Planning Department would be generated. The system would be sized in accordance with workforce levels (Section 2.3.7). If the On-Site Ore Processing Facility were constructed, then designs for handling of domestic liquid waste and other wastes, such as those from an on-site laundry, would be submitted to Fremont County Planning Department for review and approval.

Waste Petroleum Products and Chemicals

Wastes would be typical wastes for a mining operation and would include antifreeze, fuels, lubricants, or other products used in daily operations and maintenance. Energy Fuels would be a Conditionally Exempt Small Quantity Generator of hazardous wastes, per EPA definition. Waste chemicals would be clearly labeled and stored in sealed containers above ground in accordance with the requirements of the EPA. These wastes would be periodically collected by a commercial business for recycling or disposal in a licensed disposal facility.

Groundwater

Groundwater would be recovered during well installation, sample collection, aquifer testing, and surface and underground mine dewatering. For all but mine dewatering, the groundwater would be discharged to the surface under the provisions of a general WYPDES Permit, in a manner that mitigates erosion, or would be reused in drilling. Groundwater from mine dewatering is discussed in Section 2.3.11 (Water Management Plans).

Ore Processing Waste (11(e)(2) Byproduct Material)

If the On-Site Ore Processing Facility is constructed, liquid waste meeting the definition of 11(e)(2) byproduct material would be generated within the facility. The liquid waste would include:

- A 40 gpm (estimated) extraction plant bleed stream;
- A 10 gpm (estimated) bleed stream from the precipitation circuit;
- Stormwater runoff from the facility area (see Section 2.3.3.7.2); and
- Wash down water from the facility area (see Section 2.3.3.7.2).

Liquid 11(e)(2) byproduct waste would be disposed of within the Holding Pond.

2.3.10.3 Solid Waste Management

Solid wastes would be produced during the Project. If the On-Site Ore Processing Facility is constructed, some of these wastes would be classified as NRC 11(e)(2) byproduct material.

The solid non-11(e)(2) byproduct materials would include: non-hazardous materials typical of office facilities and mining operations, such as paper, wood products, plastic, steel, biodegradable items, and sewage sludge; and hazardous materials also typical of mining operations, such as waste petroleum products and used batteries. The solid non-11(e)(2) byproduct materials would be recycled or disposed of off-site at a licensed facility. Energy Fuels would be a Conditionally Exempt Small Quantity Generator of hazardous wastes, per EPA definition. Some of the demolition debris generated during reclamation would be buried on-site.

The solid waste byproduct from the dewatering water treatment system would be a sludge that could be classified as 11(e)(2) byproduct material. In accordance with the provisions of the WYPDES Permit (WDEQ, 2015b), the sludge would be transported off-site to a licensed facility for disposal. If the On-Site Ore Processing Facility is constructed, the sludge could be disposed of at the facility.

If the On-Site Ore Processing Facility is constructed, solid waste classified as 11(e)(2) by product material would include:

- inert filter media (e.g., filter cloths or bags);
- filter cake from the extraction circuit;
- solid waste byproduct in the form of a sludge that would be formed if the optional water treatment processing system is implemented,
- process equipment that could not be decontaminated during facility decommissioning;
- solids precipitated in the Holding Pond;
- the processed ore (spent heap leach material); and
- domestic solid wastes.

During Construction and Operation, all the solid 11(e)(2) byproduct material, other than the processed ore in the Heap Leach Pad, would be temporarily held in an interim solid waste management area identified within the processing facility. During reclamation, final disposal of this material would be in a segregated section of the Heap Leach Pad. The interim solid waste management area (within the heap leach area) may be subject to the requirements of 40 CFR § 61 Subpart W, as determined by the EPA.

2.3.11 Water Management Plans

2.3.11.1 Surface Water

Energy Fuels has an active and current SWPPP under their WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). The SWPPP would be updated as necessary through the permit. Per the requirements of the WDEQ-LQD permit, Energy Fuels has designed surface water drainage control measures based on site-specific conditions, including precipitation data, design storms, topography, and erosion potential of soils. The measures include smaller scale features such as culverts and ditches along roads (Section 2.3.3.3), and larger scale features such as an extensive system of channels and sediment ponds to control surface water runoff in the ephemeral drainages in and around the Congo Pit (Section 2.3.4.2). To help protect the perennial Crooks Creek to the west of the Project Area, a 500-foot buffer along the eastern edge of the creek is proposed within which there would be no surface disturbance.

As noted in Section 2.3.3.4 (Utilities), non-potable water for ore processing, dust suppression on the site roads, fire suppression systems, and washing equipment would be supplied by dewatering of the Congo Pit and Sheep shafts. This water would be stored in a lined temporary storage pond on the Ore Pad. Use of this untreated water would be limited to areas where drainage is controlled (in and around the Congo Pit) to avoid the potential for off-site drainage. It is anticipated that higher usage rates of non-potable water would occur during the summer months when more water is evaporated and more water is needed for dust suppression. The site stormwater controls including use of untreated water for dust suppression have been approved by the WDEQ through various permits such as the WDEQ-LQD Mine Permit 381C (WDEQ, 2015a), SWPPP, and WYPDES Permit (WDEQ, 2015b).

Energy Fuels anticipates that, during the first year of mining, the dewatering rate would exceed the consumption rate, based on the site-wide water balance (WDEQ, 2015a). The amount of excess water would depend on whether or not the On-Site Ore Processing Facility is constructed. Make-up water requirements for an on-site processing facility are expected to range from 150 to 300 gpm. Assuming Sheep Underground operations commence three years after Congo Pit operations commence, Congo Pit dewatering rates are approximately 182 gpm over the life of the mine with peak flow of 275 gpm, and an estimated Sheep Underground dewatering requirement of 750 gpm during initial dewatering with 250 gpm thereafter, the estimated inflows (exclusive of climatic considerations) are illustrated in Figure 2.3-7. The estimated outflows are illustrated in Figure 2.3-8, and the results of the preliminary site-wide water balance are illustrated in Figure 2.3-9.

As seen in Figures 2.3-7 through 2.3-9, several scenarios are likely to occur: 1. Operation of the Congo Pit combined with an on-site processing facility will likely result in a small water shortage, up to 60 or 70 gpm. The additional water required to operate the processing facility may be obtained through pumping from the Sheep Underground mine using established groundwater rights. 2. Operation of the Congo Pit without an on-site processing facility is anticipated to result in a water surplus on the order of 150 to 200 gpm. 3. Combined Congo Pit and Sheep Underground mining operations are anticipated to result in excess water management on the order of 200 to 600 gpm; however, during initial Sheep Underground dewatering (prior to commencing underground mining operations), excess water on the order of 800 to 1,000 gpm may be anticipated; and 4. After initial dewatering, operation of the Sheep Underground Mine alone is anticipated to result in an approximate water balance for the scenario with an on-site processing facility. If off-site processing is employed, energy Fuels anticipates that excess water would be generated that would require surface discharge.

Energy Fuels has an approved WDEQ-WQD WYPDES Permit (WY0095702) for the treatment and discharge of mine water in accordance with the provisions of the WYPDES program (WDEQ, 2015b). Water from the Congo Pit and Sheep shafts would be pumped through pipelines to a lined temporary storage pond on the Ore Pad (Map 2.3-1). The treatment system would be designed for a retention time of 3 days, continuous operation throughout the year, and an average treatment rate of 200 gpm. The lined temporary storage pond capacity would be 155,550 cubic feet (Energy Fuels, 2015b). The treatment parameters are based on the quality of the groundwater at the Congo Pit and Sheep shafts, as discussed in the following section.

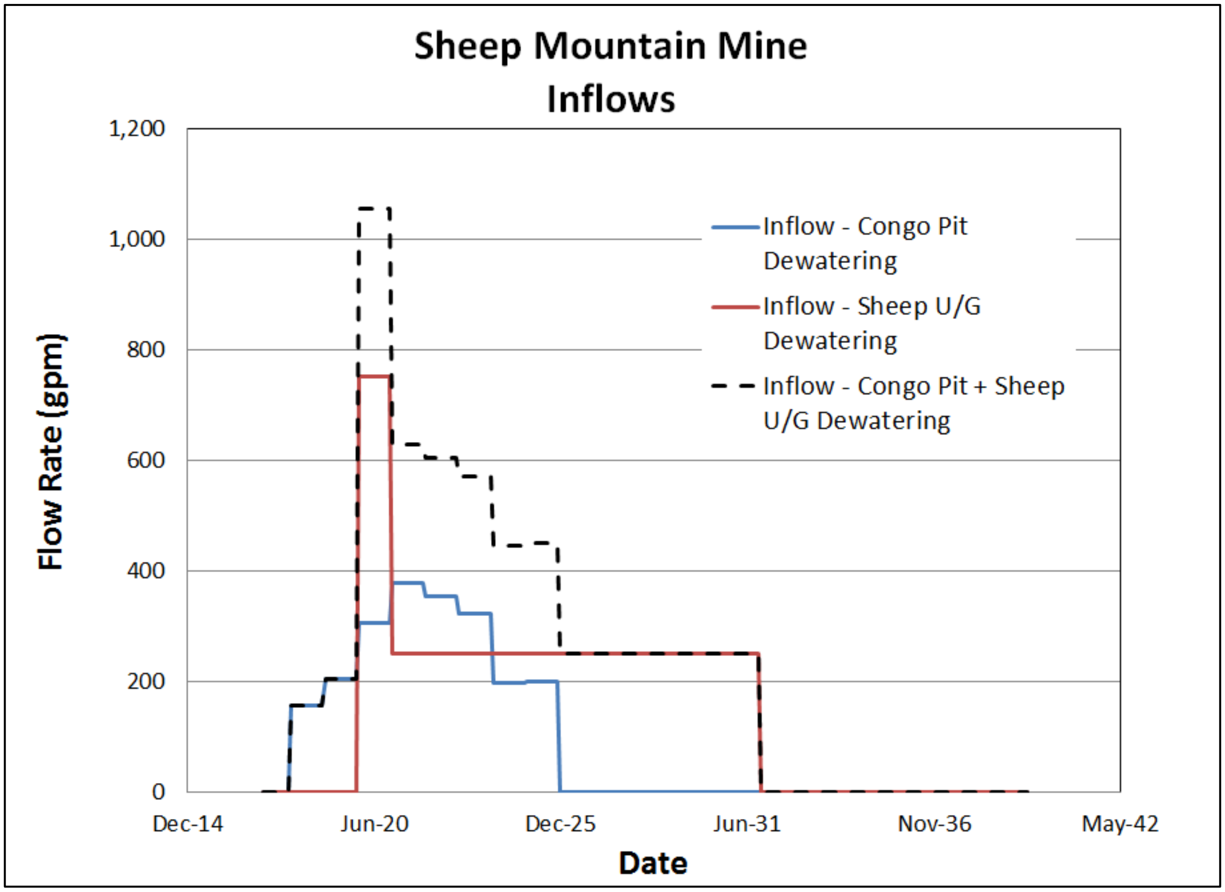


Figure 2.3-7
Preliminary Water Balance Inflows

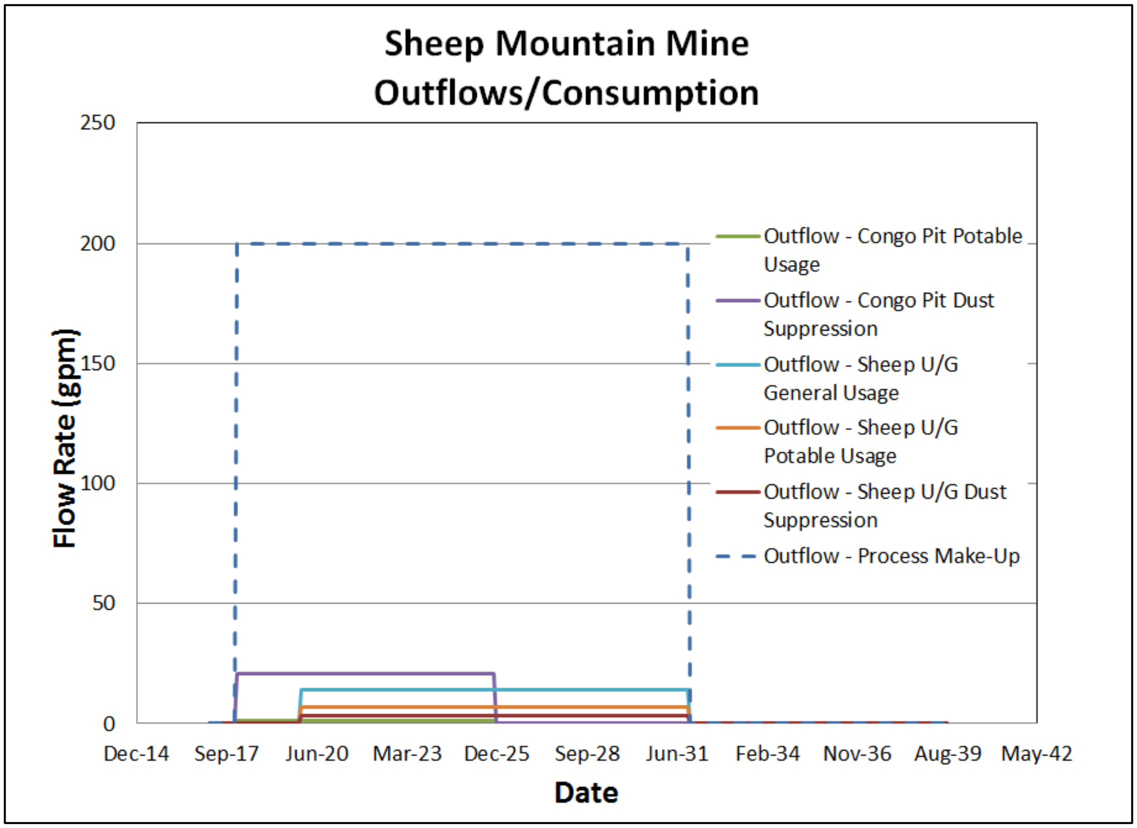


Figure 2.3-8
Preliminary Water Balance Outflows

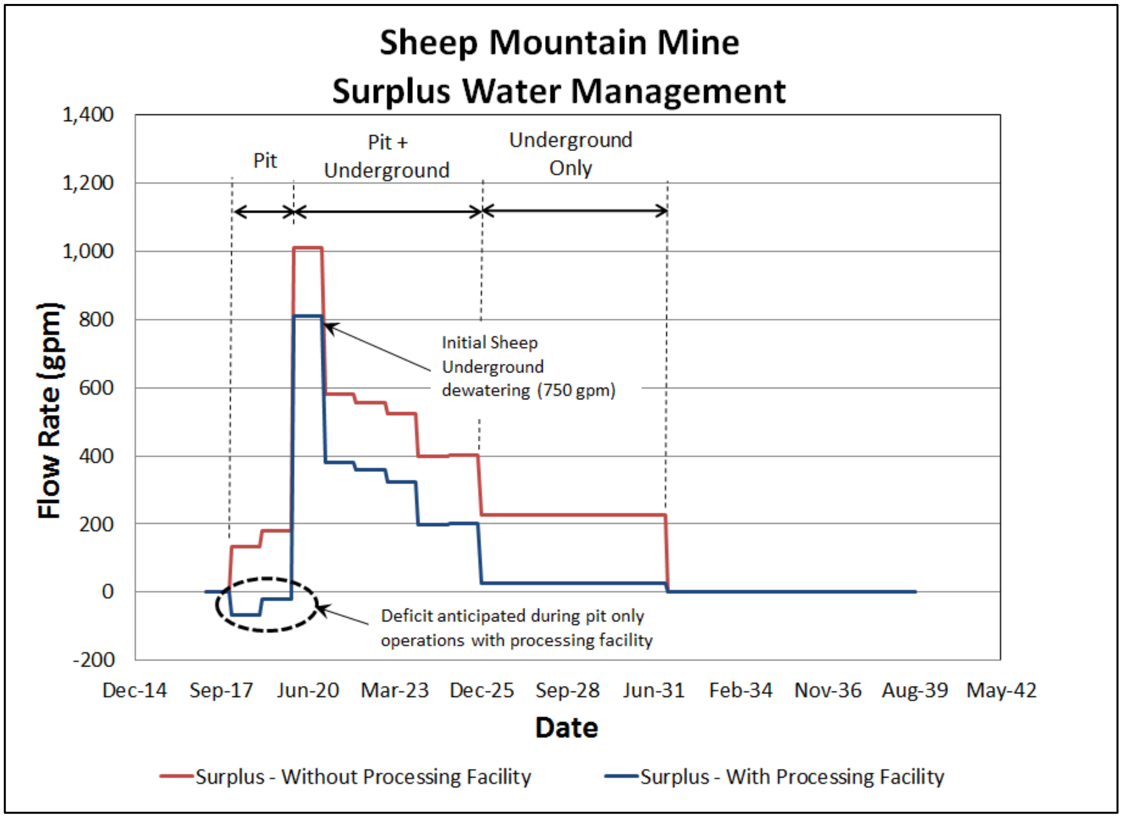


Figure 2.3-9
Preliminary Water Balance Results

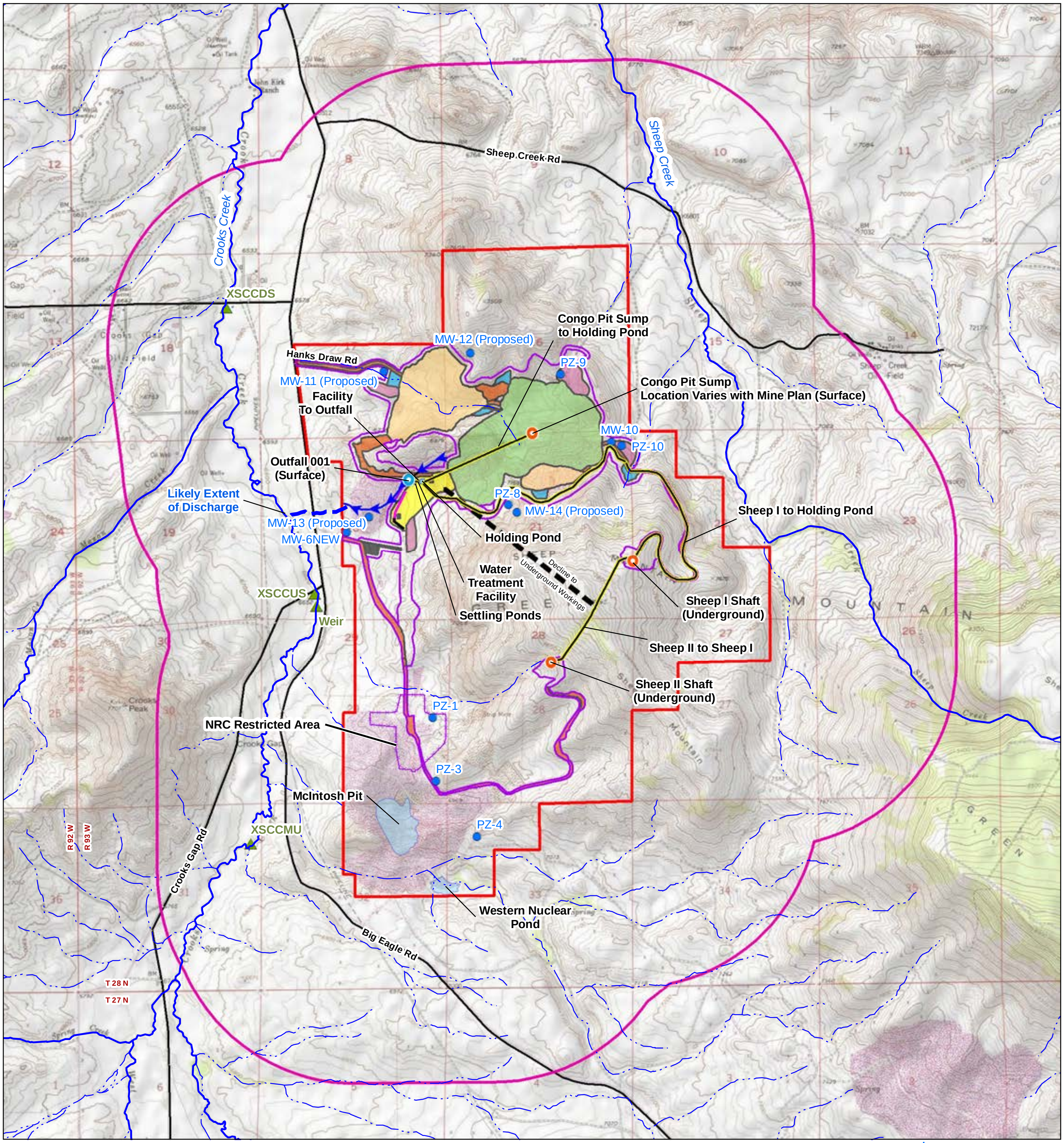
In accordance with the provisions of the WYPDES Permit, the excess water would be treated using barium chloride and pumped into one of two sedimentation ponds to allow for settling of barium sulfate. The ponds would be drained and dredged alternately, and sludge from the ponds would be trucked off-site for disposal (unless an on-site processing facility is constructed). Treated water from the ponds would be discharged to the ephemeral drainage on the northwest side of the Ore Pad (see Map 2.3-3). This drainage was constructed by WDEQ-AML as part of their reclamation of the Paydirt Pit several years ago. Hanks Draw was used for this purpose previously, during the Western Nuclear operations in the 1970s-1980s (Section 2.2.2.1). Energy absorbing riprap would be used at the outfall to the ephemeral drainage to prevent significant damage to, or erosion of, the drainage, and the capacity of the culvert(s) under Crooks Gap/Wamsutter Road would be checked. The discharge rate from the treatment system to the ephemeral drainage is anticipated to range from 0.06 to 1.98 million gallons per day – mgd (Figures 2.3-10 through 2.3-13). This range of discharge rate converts to 0.09 cubic feet per second (cfs) to 3.06 cfs or 42 to 1,375 gpm. Effluent limits consider federal and state regulations and standards and incorporates the most stringent requirements. See Section 2.3.12.3 and Appendix 2B for more information on effluent limits. If determined necessary to meet limits, a processing step for uranium removal would be added to the treatment system (e.g., ion exchange, IX, treatment).

The On-Site Ore Processing Facility, which would be regulated by the NRC, would be required to incorporate surface water management practices which account for significant rain, such as the 1,000-year design storm for this geographic location (e.g., Section 2.7.2 in NUREG-2126 – NRC, 2014). Stormwater runoff from the adjacent lands would be prevented from interacting with the Heap Leach, Treatment Ponds, and associated buildings and would be detained within an existing, permitted impoundment northeast of the facility. Stormwater runoff from the Heap Leach Pad and associated buildings would be contained in the triple-lined Holding Pond with double leak detection where it would be removed via evaporation. See Section 2.3.3.7 for details into the design requirements of the Holding Pond and water management of the On-Site Ore Processing Facility.

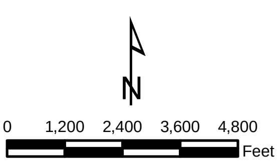
2.3.11.2 Groundwater

Both the Congo Pit and Sheep Underground Mine would require dewatering for operations. Based on the depth to groundwater, dewatering of the Congo Pit would be required starting during the first year of mining operations. Dewatering of the pit would be accomplished by pumping from sumps in the pit floor. The dewatering rates would range from about 156 gpm in the first year, increase to about 377 gpm in the fourth year, and then decline to about 199 gpm in the eighth year of mining the pit (WDEQ, 2015a).

Dewatering of the Sheep Underground Mine would be required before re-opening the mine in order to evaluate the condition of the shafts and underground workings. Dewatering from the Sheep I and/or Sheep II shafts is scheduled to begin during the Construction phase and is anticipated to require continuous pumping at a rate of 750 to 1,000 gpm for a period of approximately 9 months to 1 year (WDEQ, 2015a). After initial dewatering of the Sheep Underground Mine and during operations, a steady-state dewatering rate of 250 to 400 gpm is expected, based on historical information (WDEQ, 2015a). The water would be used for dust suppression, ore processing, cleaning and maintenance, fire suppression, and other uses throughout the site as shown on Figures 2.3-10 to 2.3-13.



Map 2.3-3
Layout of Water Treatment System



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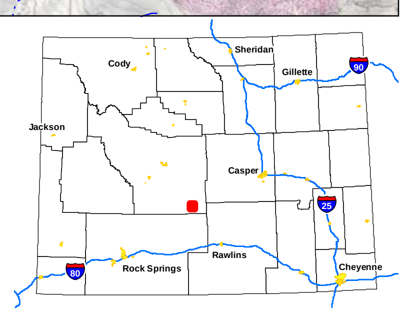
Sheep Mountain Project Area
Intake/Outfall Locations
Intake
Outfall
Approximate Pipeline Alignment
Water Treatment Facilities
Holding or Settling Pond
Water Treatment Facility

Surface Water Monitoring Location
Existing Monitoring Location
Drainage Controls
Berm
CMP
Containment Ditch
Diversion Ditch
1 Mile Buffer of Mine Permit Boundary
DECLINE

Proposed Mine Features
Congo Pit
Ore Pad
Topsoil Stockpile
Spoils
Ponds
Roads
Buildings and Parking



During development of the underground mine and once the underground mine is operational, an average of approximately 20,000 gallons of water would be consumed per day in the ventilation system and during operational drilling. This water (about 14 gpm) would be made available by the continuous dewatering of the underground mine.

As discussed in the previous section, the rate of dewatering is expected to exceed the rate of water consumption during the first year of operations. WDEQ-WQD issued a WYPDES Permit to treat and discharge the excess water. Based on the groundwater quality data (Appendix A to Attachment E of the WYPDES Permit Application - Energy Fuels, 2015b), treatment for radium would be necessary and would be accomplished by precipitation with barium chloride. Treatment for uranium may also be necessary, which would be accomplished by ion exchange (Energy Fuels, 2015b). The treatment parameters and associated effluent limits are listed in WYPDES Permit WY0095702 (WDEQ, 2015b).

The treatment rate would be lowest during the initial part of the Project, mining of the Congo Pit, which is illustrated as Phase 1 in Figure 2.3-10. The treatment rate would be highest during the initial dewatering of the Sheep Underground Mine concurrent with the last years of mining of the Congo Pit, which is illustrated as Phase 2 in Figure 2.3-11. The treatment rates would be less during the later years of mining because only the underground mine would be operational (Figures 2.3-12 and 2.3-13). Once mining and the associated dewatering cease, no discharge of water (treated or untreated) would be necessary from the mining operations.

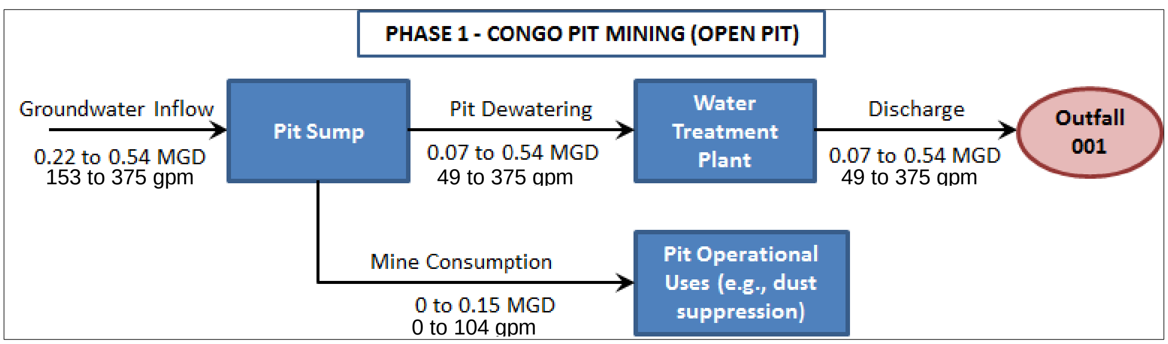


Figure 2.3-10
Schematic of Dewatering and Treatment Rates - Phase 1 of Mining

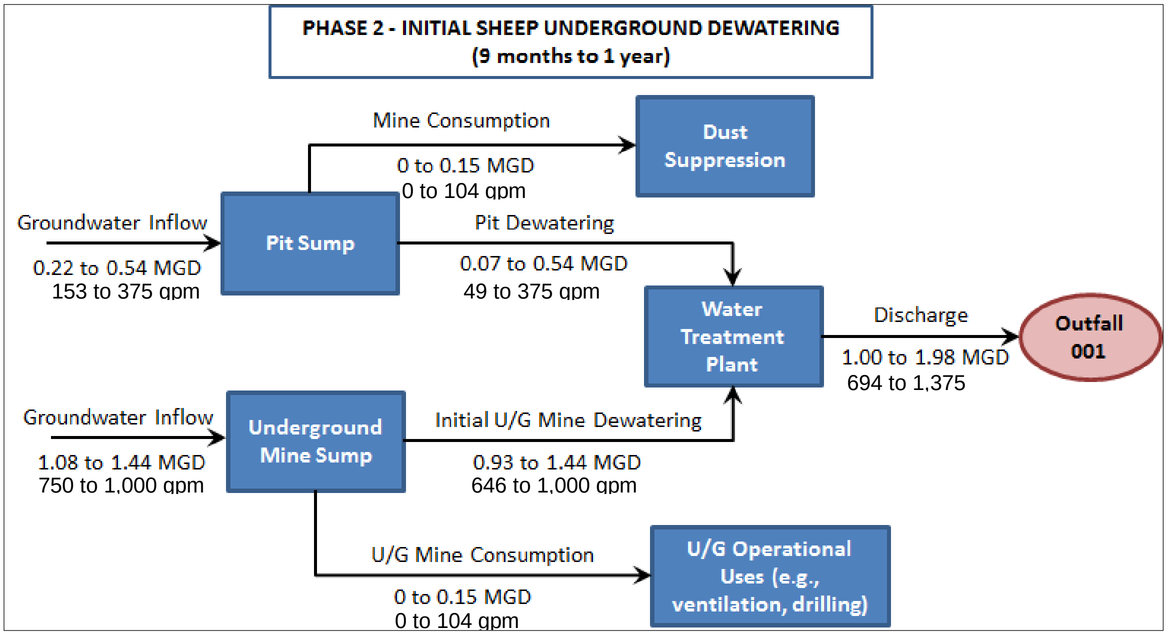


Figure 2.3-11
Schematic of Dewatering and Treatment Rates - Phase 2 of Mining

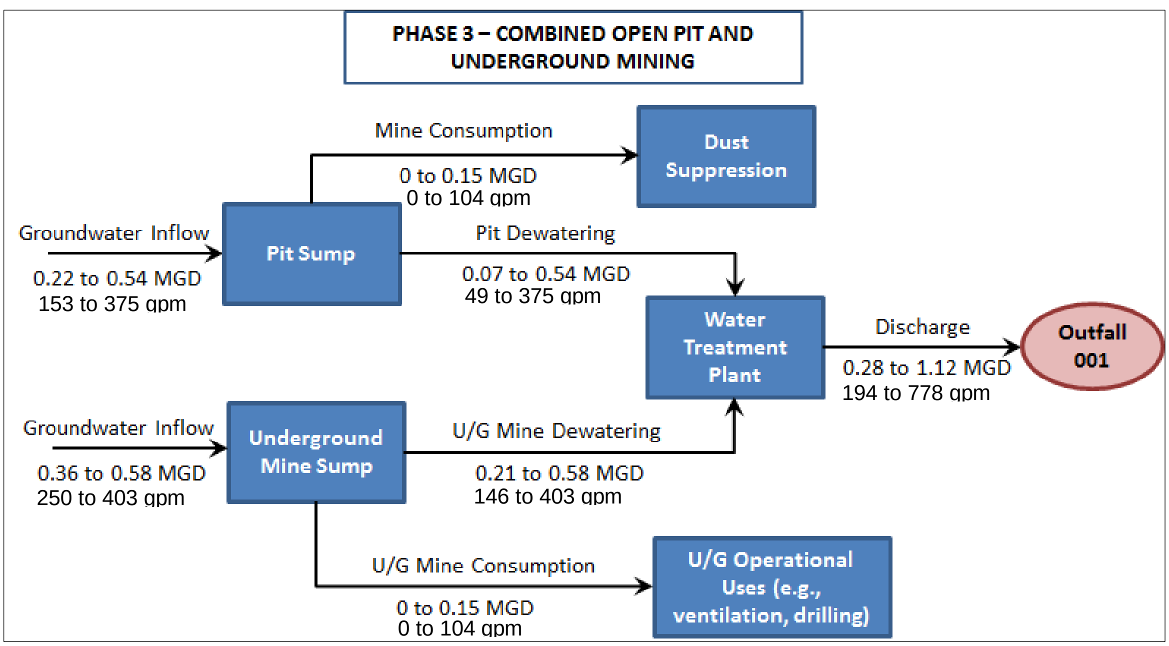


Figure 2.3-12
Schematic of Dewatering and Treatment Rates - Phase 3 of Mining

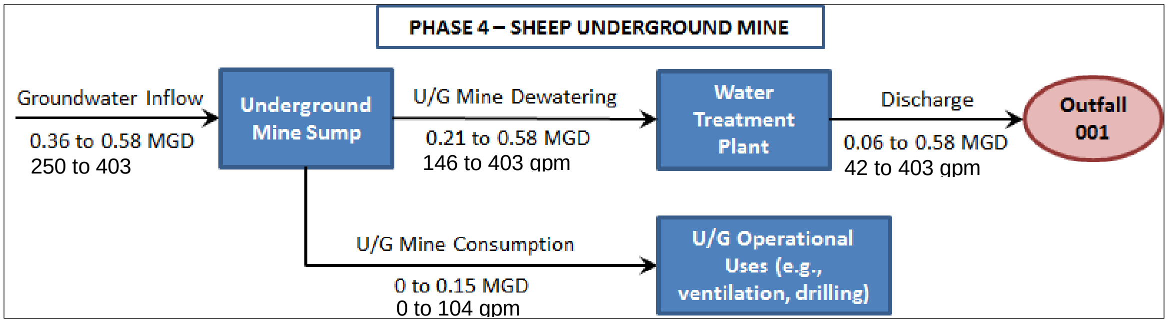


Figure 2.3-13
Schematic of Dewatering and Treatment Rates - Phase 4 of Mining

2.3.11.3 Potable Water

During Construction and the beginning of Congo Pit development, potable water would be purchased and trucked on-site from Jeffrey City for bathrooms and limited shower facilities. This water consumption would equal approximately 2,000 gallons per day (gpd) and could be accommodated by one truck or less per day. Energy Fuels anticipates 50 gallons of potable water would be consumed per day per person for showering and miscellaneous uses during Operations. Additional potable water would be required in the On-Site Ore Processing Facility for laundry facilities. During Operations, a potable water treatment system may be constructed or the WYPDES water treatment expanded, in accordance with EPA requirements, so the system could provide approximately 10,000 gpd assuming 200 personnel at full capacity. Energy Fuels currently has several wells on-site that could be used to supply this water demand, and if necessary, these wells could be combined with other sources (dewatered water, Jeffrey City water) to satisfy this need. Water use in Wyoming is managed by the State and any water used on-site would have to meet the State standards for its applicable use. Use of water from Jeffrey City would need to be permitted and allocated through the appropriate agencies and/or organizations.

2.3.12 Baseline Data Collection and Subsequent Monitoring

2.3.12.1 Overview

Monitoring of the Project Area is on-going in accordance with the requirements of WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and would extend throughout the life of the Project, including baseline data collection, environmental monitoring during operations, and operational monitoring, and monitoring during Reclamation and Decommissioning.

Some monitoring would be conducted for the life of the Project, while other monitoring would depend on the phase of the Project. The monitoring results would be periodically evaluated by Energy Fuels, through the WDEQ-LQD and NRC Annual Reports, which would be shared with the BLM. The monitoring results would be evaluated for consistency with the appropriate regulation and/or permit by the overseeing agency. The monitoring results and Annual Reports would also be provided to the various agencies, including the BLM, for review and evaluation of the adequacy of the reclamation bond.

Baseline data collection and monitoring comply with all state and federal regulations, including but not limited to:

- BLM 3809.401 (4) and BLM 3809.420
    - o Primary focus is surface and groundwater quality and quantity; air quality;

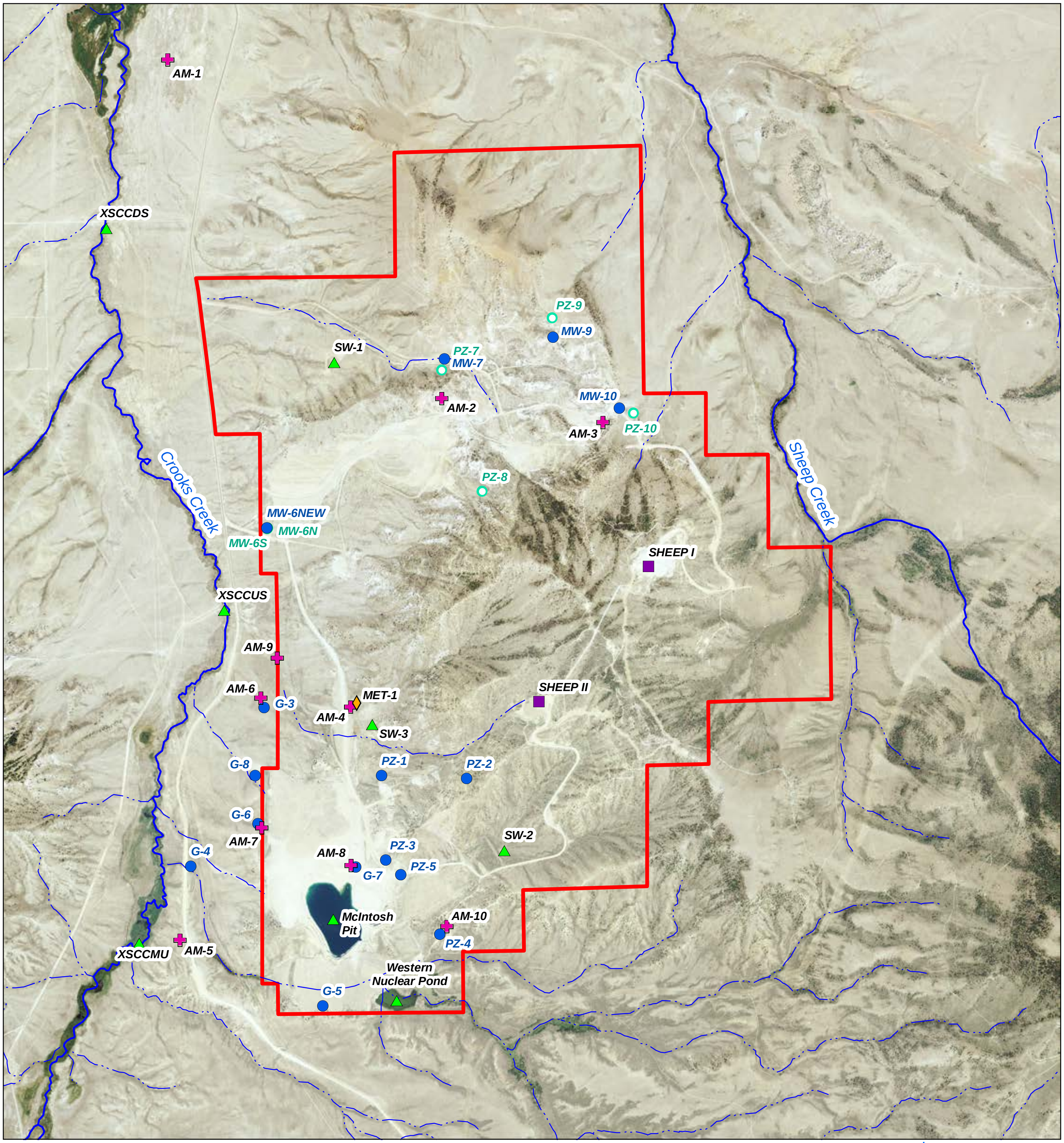
revegetation stability; noise; and wildlife

- WDEQ-LQD
  - Primary focus is mine reclamation; revegetation stability, diversity, and productivity; surface and groundwater quality and quantity; and erosional stability
- WDEQ-AQD
  - Primarily fugitive dust and carbon emissions
- WDEQ-WQD
  - Primarily SWPPP, surface water discharge (WYPDES)
- NRC
  - Primary focus is environmental pathways (air, water, soils, flora, and fauna) for radiological and non-radiological constituents
  - Radiation exposures both occupational and to the general public
- EPA
  - Primary focus is radon gas emissions regulated under the National Emissions Standards for Hazardous Air Pollutants (NESHAPs)
- MSHA
  - Primary focus is worker health and safety including fugitive dust; underground working levels with respect to gases (including radon in underground mines); exposures to chemical and solvents; and noise
- Wyoming State Mine Inspector
  - Primary focus is worker health and safety
- Wyoming State Engineer’s Office (WSEO)
  - Primary focus is surface water impoundments and water rights
- WGFD and FWS
  - Primary focus is wildlife

Additional details on the monitoring for each environmental category (e.g., vegetation) are discussed in Chapter 4.

2.3.12.2 Baseline Data Collection

Pre-operational baseline data collection has been completed in consultation with the WDEQ and the BLM in accordance with appropriate regulations and guidance documents. The NRC will review Energy Fuels’ baseline information once an application is filed with the NRC. In cases of overlapping guidance and/or regulation, the most extensive requirements have been met. The data collection program has been in place for more than 1 year and followed the prescribed quality control and assurance requirements. Map 2.3-4 shows the location of pre-operational baseline data collection locations for groundwater and surface water, air quality, and radiological parameters. In addition, pre-operational surveys and sampling programs have documented baseline conditions relative to wildlife, vegetation, soils, and climate. Pertinent data is summarized in Part 8 in the Plan of Operations (Energy Fuels, 2015a). As noted in Section 2.2.2, much of the Project Area was disturbed by historic mining. Therefore, the baseline data collection included delineating the historic disturbance as well as establishing baseline conditions in undisturbed areas.



Map 2.3-4
Pre-Operational Monitoring and Sample Locations

N

0 4,000 Feet

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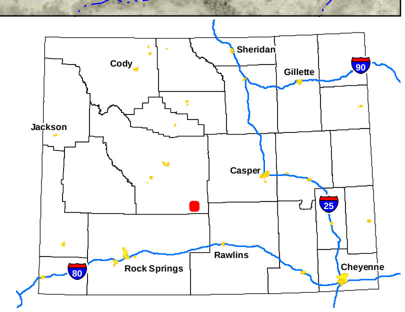
Sheep Mountain Project Area

Monitoring Points	Groundwater Monitor Wells
Shaft	Current
Weather Station	Historic
Air	
Surface Water	



Air

Map 2.3-4 shows the location of air monitor stations which monitored radioparticulates, radon-222, and direct gamma radiation; no site PM_{10} (particulate matter greater than 10 microns in effective diameter) or $PM_{2.5}$ (particulate matter greater than 2.5 microns in effective diameter) data have been collected to date. All air monitors (AM-1, AM-2, and AM-4 through AM-9) collected continuous air samples for a minimum of 1 year. Air Monitor 3 was re-located to a new location, AM-10, in the fall of 2012, upwind of the proposed processing facility based on monitoring of wind direction. Air Monitors 2 and 10 are well removed from the mineral processing facilities and were established for environmental baseline determination. The permit issued by WDEQ-AQD does not require air monitoring. If air monitoring is required in the future, AM-2 would need to be relocated because it falls within the current open pit footprint.

Soils

Order 2 soil mapping was done in August 2010 and additional areas were surveyed in September 2013. Existing topsoil stockpiles from previous disturbances were sampled in June 2014 to verify viability for use as replacement topsoil (BKS Environmental Associates, Inc. - BKS, 2014a).

Surface Water

Surface water has been continuously monitored for a minimum of one year along the nearest potential receiving surface water body, Crooks Creek, at three locations as shown on Map 2.3-4 to establish background conditions upstream (XSCCMU), adjacent to (XSCCUS), and downstream of the Project Area (XSCCDS). The monitoring has included creek flow and quality. Water quality has also been monitored in McIntosh Pit and Western Nuclear Pond. In addition, three ephemeral impoundments (SW-1 through SW-3) are sampled if water is available in them when the other surface water samples are collected.

Groundwater

Groundwater monitoring to establish baseline hydrologic and water quality conditions both upgradient and downgradient of the proposed mines and On-Site Ore Processing Facility has been completed with a continuous record of at least 1 year. In addition, some groundwater monitoring wells and the McIntosh Pit have been sampled continuously on an annual basis since 1988.

Vegetation

Vegetation communities were originally mapped during the 1980 baseline assessment and revised mapping was conducted in conjunction with vegetation sampling in 2010. In 2014, the previously mapped vegetation communities were extended as necessary to accommodate the updated proposed disturbance area boundary (BKS, 2014b).

Wildlife

Wildlife surveys have been completed for the Project in consultation with the BLM, the WGFD, and the FWS. The results of the wildlife surveys are referenced under Part 8.9 of the Plan of Operations (Energy Fuels, 2015a).

2.3.12.3 Environmental Monitoring during Operations

In some cases, environmental monitoring during operations is the continuation of baseline data collection; however, the frequency may change according to permit and/or license conditions. A summary of the site environmental monitoring program is provided in Table 2 in Appendix 2-B and includes surface water, dewatering discharge, groundwater, air, noise, soil, vegetation, and wildlife monitoring.

Surface Water

Surface water in Crooks Creek would be monitored throughout the life cycle of the Project on a quarterly basis for stream flow and WDEQ-LQD and NRC water quality parameters. Sediment ponds would be monitored during Operations and until removed during Reclamation. The water depths in the ponds would be measured along with water quality sampling for WDEQ-LQD and NRC water quality parameters. Additional sampling would be conducted as appropriate should a spill or excursion be detected.

The quantity and quality of any discharge of water from dewatering operations would be monitored in accordance with the requirements of the WYPDES Permit. General monitoring frequency requirements are described below in Table 2.3-19, and monitoring parameters are described in Appendix 2-B. For more information see WYPDES Permit WY0095702.

Table 2.3-19
WYPDES Permit WY0095702 Monitoring Requirements

Parameter	Measuring Frequency	Sample Type
Chemical Oxygen Demand, mg/l	Quarterly	Grab
Dissolved Radium 226, pCi/l	Monthly	Grab
Dissolved Zinc, micrograms per liter - µg/l	Monthly	Grab
Flow, mgd	Weekly	Instantaneous
Oil and Grease, mg/l	Daily	Visible Sheen
pH	Quarterly	Grab
Total Radium 226+228, pCi/l	Monthly	Grab
Total Selenium, µg/l	Monthly	Grab
Total Suspended Solids, mg/l	Weekly	Grab
Total Uranium (as U), mg/l	Monthly	Grab
Total Zinc, mg/l	Quarterly	Grab
Duration of Discharge	Monthly	Report Number of Days of Discharge

Groundwater

Groundwater monitoring would be conducted throughout the life cycle of the Project according to the NRC-approved license and the WDEQ-LQD Permit to Mine 381C. Groundwater monitoring would be conducted on a quarterly basis for water levels and water quality, including both WDEQ-LQD and NRC water quality parameters. Additional sampling would be conducted as appropriate should a spill or excursion be detected.

Air

To ensure compliance with 10 CFR §§ 20.1301, 20.1302, and 20.1501, air monitoring would be conducted in accordance with the WDEQ-AQD Permit P0015550 (WDEQ, 2015c). Mobile measurements would be taken as required within the work place.

Mine-related air quality monitoring and measurements would be required for underground working levels to protect worker's health and safety as required by MSHA and the Wyoming State Mine Inspector's Office. EPA would require monitoring of radon gas from mine vents as per 40 CFR § 61, Subpart B; however, the extent and frequency has not yet been established.

Annual Method 9 observation of the crusher, screen, and conveyor transfer points to measure the opacity of fugitive emissions would be required to demonstrate compliance with the WDEQ-AQD permit condition setting a 20 percent opacity limit on these sources.

Noise

The National Institute for Occupational Safety and Health (NIOSH) recommends an exposure limit for workplace noise of 85 decibels (dBA) for a duration of 8 hours per day (NIOSH, 1998). Exposures at and above this level are considered detrimental to hearing. MSHA regulations further require routine worker screening for hearing loss. Occupational noise levels would be monitored per MSHA and/or NIOSH regulations. Environmental noise would be estimated based on distance from the source and confirmed with spot measurements for initial operating conditions and updated annually.

Soil

Soil would be monitored downwind of the processing facility annually for Radium-226, Thorium-230, and Lead-210 per NRC requirements.

Vegetation

Energy Fuels would monitor vegetation for radionuclide uptake as required by NRC regulations on an annual basis. WDEQ regulations require monitoring of areas that have been revegetated for cover, diversity, and productivity. Revegetated areas would be compared to pre-established reference areas to measure the success of revegetation and to ensure the reclaimed lands have been returned to pre-mine land use.

Wildlife

Energy Fuels would continue wildlife surveys prior to and during mine operations with a focus on species of concern and wildlife mortality. Raptor surveys would be conducted annually.

2.3.12.4 Operational Monitoring Programs

Operational monitoring includes Stability/SWPPP Monitoring, Early Detection Monitoring, and Personnel and Workplace Monitoring (see Table 2 in Appendix 2-B). Additional operational monitoring requirements would be based on the license and permit conditions of the NRC and WDEQ.

Stability/SWPPP Monitoring

Site stability and erosion would be monitored under the SWPPP within the Project Area. The SWPPP would be updated as needed when site conditions related to new mine disturbance or mine reclamation change. The SWPPP calls for routine inspection and spot inspection following significant precipitation or runoff events. Monitoring would be conducted to evaluate slope stability and development of any subsidence features. Slope stability monitoring in the Congo Pit and Hanks Draw Spoils Facility would include visual inspection for features such as tension cracks, bulges, and survey of control points by electronic distance measuring equipment or similar devices. Subsidence monitoring would be conducted during mining of the Congo Pit, as well as during underground mining. Because the Congo Pit overlies older mine workings, a ground control crew would be on site during excavation to review historic maps, conduct seismic testing, as well as visual inspection. At the Sheep Mountain Mine, monitoring for surface subsidence would be conducted during monthly inspections of the areas being mined and daily inspections of access roads when the roads were being undermined.

Early Detection Monitoring

Early detection operational monitoring is focused on mineral processing operations and includes:

- Routine measurement of solution flows in relationship to the anticipated water balance.
- Routine inspection of the Heap Leach Pad and plant site.
- Continuous monitoring of leak detection systems.

Flow of solutions throughout the system would be measured and recorded using an automated system. Anomalous flow conditions in the system would be immediately investigated to determine the cause and if there is need for corrective action.

Routine inspection of the plant and Heap Leach Pad would include general observation of all work areas with respect to general housekeeping and would insure that instrumentation is functioning properly. Inspections would include visual inspections of the perimeter of the plant, ponds, and Heap Leach Pad and inspection of the leak detection systems (see Section 2.3.3.7.1 for a description of the Heap Leach Pad liner system). Inspection logs would be kept and included in internal weekly, monthly, and annual inspection reports.

Leak detection systems would monitor the Heap Leach Pad and ponds. Any flow within the leak detection system would be directed by gravity flow to individual sumps with automatic level alarms and pump back systems.

Personnel and Workplace Monitoring

Monitoring of personnel and the workplace is required in the mines (surface and underground), the On-Site Ore Processing Facility, and in the office and maintenance facilities with respect to potential occupational exposures. The nature, extent, and frequency of personnel and workplace monitoring varies based on the potential exposure pathways and risks. Occupational exposure to chemicals and solvents is regulated. Compliance with the Global Harmonized System (GHS) and Safety Data Sheets (SDS) are required for chemicals in use or stored on-site (OSHA, 2016).Within the NRC Restricted Area, personnel and visitors are required to complete radiological scans prior to exiting the facility. Work areas within the NRC Restricted

Area would be monitored, either through fixed instrumentation or routine testing, as determined by the license conditions. Personnel working in radiation protection areas would be equipped with individual monitors and/or badge and would be required to participate in a routine bioassay program to further monitor exposure to radionuclides.

Work areas subject to dusty conditions or chemical fumes, would be monitored through fixed instrumentation and/or routine testing as required. Engineering controls would be used in such areas to minimize exposures to the extent practicable. If the levels cannot be reduced sufficiently through engineering controls to meet regulatory requirements, then PPE would be required of persons entering or working in these areas.

Mine facilities would be constructed and operated with respect to health and safety under MSHA. This includes requirements for implementation of a site specific safety plan which includes task training, a material handling plan including SDS for all materials, and monitoring and testing of various environmental factors in the work place including but not limited to noise, air quality, dust, and radon gas. All training and monitoring would be documented and would demonstrate compliance with appropriate standards.

The On-Site Ore Processing Facility would require a monitoring plan as part of the NRC Source Materials License for Operations. Rigid quality control and assurance programs would be required as license conditions relating to environmental controls, worker health and safety, and potential off-site exposures for any environmental pathway.

<u>Corrective Action</u>

If operational monitoring detects conditions in excess of expected or permitted levels, considering background conditions and variability, state and federal regulations require timely reporting on the nature and location of the event. Although the specific response would be dependent upon of the nature and location of monitoring results, the general approach following discovery would be:

- Determine if emergency response and/or immediate action is required.
- Take appropriate initial action to secure the location of impact from public access, isolate the area of impact from the environment and stop the excursion at its source if possible.
- Assess the excursion with respect to public safety and the environment.
- Notify the appropriate regulatory agencies within required timeframes.
- Sample, clean-up, and dispose of associated wastes as appropriate.
- Restore the site.
- Follow up with site personnel and regulatory authorities to assess the event and measures to prevent reoccurrences of a similar nature.

2.3.12.5 Monitoring of Reclamation and Decommissioning

Monitoring during reclamation of the Project Area outside of the On-Site Ore Processing Facility includes continued health and safety monitoring and environmental monitoring to help ensure the reestablishment of a stable system (Section 2.3.5). With respect to removal and closure of the mine facilities, the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) includes requirements for monitoring the material being disposed of or left in place to ensure it is appropriately handled (see Appendix D-7 of the Mine Permit). In addition, regraded spoil sampling is required to ensure materials that could adversely impact soil quality and revegetation success are not within or adjacent to the root zone (Section 4.3.3 of the Reclamation Plan in the Mine Permit). It also includes sampling of sediment from ponds to determine if the material must be disposed of with other material unsuitable for near-surface disposal (Section 2.3.5.3). With respect to surface disturbance, the WDEQ-LQD Permit to Mine 381C includes requirements for post-mine topography, drainage reestablishment (including surface water flow and quality), and evaluation of revegetation success. With respect to groundwater, the WDEQ-LQD Permit to Mine 381C includes requirements for monitoring to evaluate recharge rates and water quality stability relative to projected post-mine conditions. As noted in Section 2.3.5.11, when the reclamation is considered complete by WDEQ-LQD, the reclamation bond is released and jurisdiction terminated.

The monitoring during decommissioning of the On-Site Ore Processing Facility would focus on continued health and safety monitoring and removal of 11(e)(2) byproduct material from areas outside the Heap Leach Pad and stabilization of the Heap Leach Pad for long-term care and monitoring (Section 2.3.5.5). As noted in Section 2.3.5.12, a plan for long-term activities would be developed prior to transfer of the facility to the designated agency.

2.4 BLM MITIGATION ALTERNATIVE

This alternative was developed in response to public and agency inputs collected during the scoping process in order to potentially reduce the environmental impacts of the Project. This alternative is similar to the Proposed Action, in that conventional mining techniques would be utilized and uranium would be processed using heap leach and solvent extraction/ion exchange processes either on-site at the On-Site Ore Processing Facility or off-site at the Sweetwater Mill. This alternative would utilize the same processes and take place over the same time period as the Proposed Action but with the below described changes and mitigation procedures implemented to reduce and/or otherwise offset surface disturbance and potentially limit impacts to human health, safety, and the environment. Because of the unique aspects of the Mining Laws and 43 CFR § 3809 regulations, the BLM's decision making authority is limited in requiring certain mitigation measures. It is important to emphasize that the ROD would determine if and to what extent the BLM Mitigation Alternative would be implemented to prevent unnecessary and undue degradation of public lands. Therefore, the mitigation measures presented in Table 2.4-1 are for analysis purposes only.

Table 2.4-1 provides a summary of both the applicant-committed mitigation measures under the Proposed Action and the BLM proposed additional mitigation measures under the BLM Mitigation Alternative.

The Proposed Action describes reclaiming lands to the previous land use of grazing and wildlife habitat. Under this alternative, reclamation success would be further defined using the site characteristics in accordance with Appendix B of the Lander ROD and approved RMP (BLM, 2014a). In general, Energy Fuels would be required to develop site-specific Reclamation and Weed Management plans. These plans would utilize ecological sites and/or reference areas, reclamation potential, and area resource objectives to develop the reclamation and weed management objectives for the disturbed areas and set the site-specific reclamation standards as required by RMP Decisions 1023 through 1025. Additional site-specific measures would be required for those areas with Limited Reclamation Potential (LRP) soils. These plans would include specific measures to meet these standards and incorporate the LFO RMP's reclamation objectives and Wyoming Reclamation Policy guidelines as well. Changes required of the Reclamation Plan to meet these objectives are described as BLM Proposed Mitigation Measures in Table 2.4-1 under Vegetation and Soils.

Another aspect of this alternative, if on-site processing occurs, would require Energy Fuels to evaluate reclamation success of previously disturbed areas within the Project Area that have not achieved adequate revegetation or otherwise not met reclamation standards. These areas would be reclaimed or enhanced to meet final reclamation standards. The reclamation of these previously disturbed areas would then be used to offset public lands around the On-Site Ore Processing Facility that would be permanently removed from the public domain and transferred to the State of Wyoming or the DOE. This mitigation option includes approximately 90 acres of BLM-managed public land that would be permanently taken out of the public domain and transferred to the State of Wyoming or the DOE as a result of the Proposed Action (see Section 2.3.5.12). Ninety acres would be used for this analysis; however, the final reclaimed acreage number would depend on the final acreage of the lands being transferred.

For existing disturbances, reclamation success of previously disturbed ground within the Project Area is highly variable. Some of the unreclaimed areas for which Energy Fuels has no reclamation obligation have developed vegetation that may meet reclamation standards. This is, particularly true on some of the drill roads that dissect Sheep Mountain. However, other existing disturbances do not currently meet the reclamation objectives of the LFO RMP such as the area surrounding the Congo Pit, the Paydirt Pit and Sun Heald areas as reclaimed by WDEQ-AML. In the Paydirt Pit and Sun Heald areas, seed and established vegetation includes mostly grasses and some forb species but little or no native shrub species. Therefore, these areas would not meet BLM's final reclamation standards as they provide little habitat for other native species but are considered to be quite stable and trending to a healthy plant community. Additional enhancement would hasten the natural process to meet the objective for this standard. The general mitigation measure for this process is described in Table 2.4-1. All of the measures in Table 2.4-1 would apply to the BLM Mitigation Alternative.

Table 2.4-1
Summary of Applicant Committed Measures and Mitigation Measures

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
Climate and Air Quality	Baseline studies have included an on-site weather station and air monitoring for radiological information. Dust Suppression: Frequent watering would occur on all unpaved roads. Haul routes, including the pit floor routes, would be treated with water and/or chemical dust suppressant to control fugitive dust emissions. Tanks without airflow on all mixer settlers would be covered. Dust would be collected on the diatomaceous earth bag breaker. Water would be sprayed on the underground ore conveyor transfer and on surface and underground primary crushers. Fugitive emissions from the crusher, screen, and all conveyor transfer points would be limited to 20 percent opacity. If the On-Site Ore Processing Facility is constructed, the overland ore conveyor transfer would be completely enclosed. The active portion of the heap leach would be wetted with leach solution and covered with coarse gravel. Gaseous Emissions: Tier-2 compliant engines would be used on surface mobile and nonroad sources. Tier-2 compliant engines would be used on underground mobile and nonroad sources (with the exception of scooptrams, fuel lube truck, forklift, and mechanical service truck, which are Tier-1). Radon: See Radiological Exposure.	No measures are proposed	Mine: WDEQ-AQD Permit P0015550 approved July 2015: Includes Permit Conditions for durst control and gaseous emissions associated with mining-related activities only (not milling). WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-4 (Climatology); Mine Plan §§ 3.3.3.1 (Spoil Facility Construction) and 3.5.1 (Overland Conveyor); and Reclamation Plan § 4.4.7 (Seeding). On-Site Ore Processing Facility: NRC: On-Site Ore Processing Facility would require Source and Byproduct Materials License and include air monitoring requirements and standards specific to radiological impacts; not submitted. Off-site processing facility source and by product materials license currently in stand by status (to update would require further action by NRC; no current plans to update). EPA: Potential permit, under Subpart W, for On-Site Ore Processing Facility; not yet submitted.

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	(Plan of Operations §§ 6.2 (Air Quality and Radiation Levels) and 8.4 (Climatology).		
Geologic Resources	Baseline studies included: topographic and geologic mapping; evaluation of available seismic data; overburden sampling; ore geochemistry; and slope stability (Plan of Operations §.8.5 (Geology)). Actions to protect geologic resources during Construction, Operations, and Reclamation include: monitoring slope stability and subsidence; ground control; overburden and spoil sampling to determine need for special handling; and reclamation to stable topography. (Plan of Operations §§ 1.4 (Project Summary) and 4.1.4 (Ground Control))	No measures are proposed.	WDEQ-LQD Mine Permit to Mine 381C, as approved July 2015: Appendix D-5 (Topography, Geology, and Overburden Assessment); Mine Plan § 3.3.3.2 (Hanks Draw Spoils Facility Stability Evaluation), § 3.3.6 (Grade Control), §§ 3.3.7 and 3.4.5 (Ground Control), § 3.8 (Waste Characterization and Handling), § 3.10.4 (Site Stability Monitoring); and Reclamation Plan §4.1 (Congo Pit Reclamation), § 4.2 (Sheep Underground), § 4.4.3 (Materials Handling and Regraded Overburden Monitoring), and § 4.4.3 (Regrading and Reshaping).
Mineral Resources	Existing mineral rights holders were identified, along with evaluation of the potential for concurrent development. (Plan of Operations §§ 1.3 (Mineral & Surface Ownership), 8.1 (Land Use) and 8.2 (History))	No measures are proposed.	WDEQ-LQD Mine Permit to Mine 381C, as approved July 2015: Appendices A, B, and E (Surface and Mineral Right Holders within the Permit Area and Adjacent Lands, and Existing Facilities); and Project Overview § 2.6 (Protection of Other Resources).
Soils	Construction and Operations: Available suitable topsoil and coversoil would be salvaged, to depths identified in baseline sampling, from all areas proposed for disturbance. Topsoil stripping would be conducted in phases as areas are disturbed. The topsoil would be placed in stockpiles, which would be signed and protected from wind and water erosion. Erosion and sediment controls, including silt fences, wattles, berms, ditches, sediment and collection ponds, and culverts, would be installed throughout the disturbed areas, as	S-1: Soil amendment plans would be submitted to the BLM for approval prior to the application of any soil amendment. (Minimization)	WDEQ-LQD: Permit to Mine 381C, as approved July 2015: Appendix D-7 (Soil Assessment); Mine Plan § 3.6 (Topsoil Handling); and Reclamation Plan §§ 4.4.5 (Topsoil Placement) and 4.4.6 (Soil Amendments).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	necessary, to minimize erosion and capture sediment. Reclamation: Surface disturbances from the Proposed Action would be regraded to approximate original contours. Backfill suitability would be tested, and backfill amended as necessary. Topsoil and suitable coversoil would be replaced to specified depths, and the disturbances revegetated. (Plan of Operations §§ 4.5 (Topsoil Management Plan), 5.4.5 (Topsoil Placement and Revegetation), and 8.7 (Soils)).		
Surface Water	Baseline studies have included characterization of drainages, flow measurements, and water quality sampling. Mine: The Project has a SWPPP. This plan would be updated as necessary. Surface water flow would be diverted from the Congo Pit through a series of diversion channels and collection ponds designed for the site conditions. Surface water flow would be diverted from the Congo Pit through a series of diversion channels and collection ponds designed for the site conditions. Surface water diversions, sediment ponds, and culverts would be used to control surface water runoff from the site and minimize erosion. These features would be designed for the site conditions. All drainage that could flow off-site would meet the requirements of	No measures are proposed.	Mine: WDEQ-WQD: WYPDES Stormwater Permit WYPDES Discharge Permit – Permit for surface discharge of treated water from mine dewatering – approved 2015. WDEQ-LQD Mine Permit to Mine 381C, as approved July 2015: Appendix D-6 (Hydrology); Mine Plan §§ 3.7 (Site-Wide Stormwater Management), 3.9.2 (Site-Wide Water Management – Surface Water), and 3.10.7 (Surface Water Monitoring); and Reclamation Plan §§ 4.1.4 (Closure Surface Water Drainage Design), 4.4.4 (Regrading and Reshaping), 4.4.9 (Riparian Mitigation), and 4.8.1 (Probable Hydrologic Consequences - Surface Water Consequences). On-Site Ore Processing Facility: NRC: On-Site Ore Processing Facility would require Source and Byproduct Materials License and include surface monitoring requirements, stormwater management, and spill and leak

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	the WYPDES stormwater permit, including appropriate sediment control measures. For discharge of water from dewatering of the Congo Pit and Sheep Underground Mine, a treatment system would be constructed in accordance with the requirements of the WYPDES Permit. The discharge location would be selected to minimize the potential for erosion. Fuel and lubricant storage areas would be enclosed with berms capable of containing any spill from storage tanks within the bermed area plus adequate freeboard (generally 2 to 5 feet). Storage tanks for fuels and other liquids would comply with Chapter 17 of WDEQ-WQD's rules and regulations on storage tanks. Berms would be placed in and around facilities to control the movement of spills. Energy Fuels would select appropriate materials for pipelines and tanks, implement proper installation and testing of those materials prior to use, and inspect and maintain pipelines and tanks. Inspections would occur regularly, and should a spill or leak occur, remediation and reporting procedures would be conducted in accordance with the spill contingency plans. A 500 foot buffer along the eastern edge of Crooks Creek would be established within which there would be no surface disturbance related to the Project.		controls. Off-site processing facility source and byproduct materials license currently in stand by status (to update would require further action by the NRC; no current plans to update).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	Surface water monitoring would continue throughout the life of the Project. On-Site Ore Processing Facility (in addition to the above measures): Design features and operational requirements for the On-site Ore Processing Facility would comply with NRC requirements to minimize spills and leaks. For example, the Heap Leach Pad would be lined with a synthetic triple liner system with dual leak detection. Leak detection sumps would be placed at low points between the primary and secondary liner, as well as between the secondary and tertiary liners. The sumps would be equipped with standpipes, which would be used to access the sump for monitoring purposes and to pump out any collected solution. There would be no discharge to the surface from the On-site Ore Processing Facility. All stormwater would be captured on-site for treatment and disposal. (Plan of Operations §§ 3.2 (Open Pit Development), 3.4 (Processing Facility), 5.4.4 (Regrading and Reshaping), 6.6 (Monitoring Plan – Surface Water), and 8.6 (Hydrology)).		
Groundwater	Baseline studies have included characterization of aquifer characteristics, groundwater flow, and water quality sampling.	No measures are proposed.	Mine: WDEQ-LQD Mine Permit to Mine 381C, as approved July 2015: Appendix D-6 (Hydrology); Project Overview § 2.5.6 (Existing Conditions – Groundwater Hydrological Conditions); Mine Plan §§ 3.3.8 (Pit Dewatering), 3.4.7 (Underground Mine Dewatering) 3.9.1 (Site-Wide Water Management – Groundwater), and 3.10.8 (Groundwater Monitoring); and Reclamation Plan

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
			§§ 4.1.4 (Closure Surface Water Drainage Design), 4.4.1 (Drill Hole Abandonment), 4.4.4 (Regrading and Reshaping), 4.4.9 (Riparian Mitigation), and 4.8.2 (Probable Hydrologic Consequences - Groundwater Consequences). On-Site Ore Processing Facility: NRC: On-Site Ore Processing Facility would require Source and By Product Materials License and include surface monitoring requirements, stormwater management, and spill and leak controls. Off-site processing facility source and by product materials license currently in stand by status (to update would require further action by NRC; no current plans to update).
Water Use	Existing water rights have been identified, Energy Fuels would obtain additional water rights for project dewatering (Plan of Operations §§ 1.5.2 (State of Wyoming Permits), 4.1.5 (Mine Support and Utilities), and 8.6 (Hydrology)).	No measures are proposed.	WSEO: Permit required for any new water right; submitted as necessary. WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-6 (Hydrology); Mine Plan §§ 3.10.7 (Surface Water Monitoring), 3.10.8 (Groundwater Monitoring), and 4.8.2.2 (Groundwater Consumption).
Invasive, Non-Native Species and Noxious Weeds	Baseline vegetation studies included reconnaissance surveys for presence or absence of noxious weeds, selenium indicator species, and unique sites. Prevention and control of noxious and invasive weeds during Construction, Operations, and Reclamation would include: Seeding and revegetating areas of disturbance as soon as practical with	INNS-1: Energy Fuels would be responsible for submitting and implementing a Weed Management Plan that would address all invasive and non-native species and noxious weeds within the mine permit area including specific emphasis on the reclaimed areas, including cheatgrass, until re-vegetation activities have been determined to be successful. If noxious or invasive weeds are encountered, the	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-8 (Vegetation Inventory); Mine Plan § 3.10.6 (Vegetation Monitoring) and § 3.10.9 (Noxious Weeds); and Reclamation Plan § 4.4.8 (Revegetation). Fremont County Weed and Pest would be consulted if issues with weeds arose or is spraying was necessary.

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	certified weed-free seed; Minimizing soil disturbance to the extent possible; Using weed-free mulch/straw for erosion control; and Selecting and spraying herbicides based on weed species and desired results. Only BLM-approved herbicides would be used. Evaluation of reclamation success would take noxious weeds into account. (Plan of Operations §§ 5.4.5 (Topsoil Placement and Revegetation), 5.4.12 (Post-Closure Management), 6.5 (Vegetation), and 8.8 (Vegetation)).	BLM would be consulted for suppression and control methods. A Pesticide Use Proposal (PUP) and written approval from the BLM AO for the use of herbicides would be obtained prior to usage of herbicides. Pesticide Application Records (PAR) would also be submitted to the BLM AO on a regular basis. An annual Pesticide Use Report (PUR) would be required at the end of each season. (Minimization) INNS-2: Prior to surface disturbance, an invasive plant survey would be conducted by a qualified vegetation specialist. This assessment would show the location and species of invasive or noxious plants and the findings would be presented to the BLM. (Minimization) INNS-3: Mobile equipment being transported from an off-site location to the Project Area would be cleaned prior to arrival using water, steam, or air pressurized cleaning methods to remove any invasive or noxious weed seed and plant parts or materials that could contain seeds. When appropriate, sites off public lands where equipment could be cleaned would be identified. Seeds and plant parts would be collected and disposed of appropriately. (Avoidance) INNS-4: Energy Fuels would be responsible for suppression and/or control of any invasive or noxious plant species within the Project Area. If chemical herbicide control methods are	

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
		used on public lands, only BLM-approved chemicals and application rates and methods would be allowed. (Minimization) INNS-5: All mulch, seed, and other vegetative reclamation materials would be certified weed-free. All sand, gravel, and fill materials would be certified weed-free. (Minimization) INNS-6: Annual weed surveys would be conducted during each growing season for the life of the Project. Reconnaissance surveys would be conducted within areas that were recently disturbed by project-related actions during the previous year(s). Survey areas would include 50-foot buffers extending from surface disturbances to adjacent, undisturbed surfaces. Complete surveys of an area plus buffer would be preferred but sampling surveys of an area plus buffer might be required if the disturbed area is large. Weed species, number of plants, and/or area occupied by each weed infestation observed would be reported immediately so that infested areas would be cleared in a manner to minimize transport of weed seed, roots, and rhizomes or other vegetative materials and soil from the site to adjacent weed-free areas. (Minimization)	
Vegetation	Baseline vegetation studies to document existing conditions. During Operations:	VEG-1: At the time of reclamation, Energy Fuels would be required to obtain a BLM-approved seed mix, and a permanent site-wide seed mix would	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-8 (Vegetation Inventory); Mine Plan § 3.10.6 (Vegetation Monitoring) and § 3.10.9 (Noxious Weeds); and Reclamation Plan

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	Temporary seeding would be done where necessary to reduce erosion. During Reclamation: Spring seeding would be done after the frost leaves the ground and until May 15th. Fall seeding would be done between September 15 and the time that frost prevents preparation of a proper seed bed. Evaluation of reclamation success would be required. (Plan of Operations §§ 5.4.5 (Topsoil Placement and Revegetation), 5.4.12 (Post-Closure Management), 5.9 (Final Grading and Seeding), 6.5 (Vegetation), and 8.8 (Vegetation)).	likely not be acceptable. (Minimization) VEG-2: Genetically appropriate and locally adapted native plant materials (e.g., locally sourced or cultivars recommended for seed zone) would be selected based on the site characteristics, ecological setting, and pre-disturbance plant community. (Avoidance) VEG-3: Locally sourced and/or collected seeds would be used to the extent possible (local collection and logistics should be included in the Reclamation Plan). (Minimization) VEG-4: Non-native plants would only be used as an approved short-term and non-persistent (i.e., sterile) alternative to native plant materials. (Minimization) VEG-5: Energy Fuels would provide data to the BLM on all source material used for reclamation (e.g., where seeds were obtained, where seed originated, year collected, results of germination and viability tests - these data should accompany seed purchase). (Minimization) VEG-6: Energy Fuels would provide the BLM with small samples of all seed used in reclamation, preferably before different species are mixed together. (Mnimization) VEG-7: Seeding would take into account differential handling methods to	§§ 4.4.7 (Seeding) and 4.4.8 (Revegetation).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
		match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species. (Minimization) VEG-8: The Presidential Memorandum-Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators (June 20, 2014) would be complied with. (Minimization)	
Wildlife – ESA-Listed, Proposed, and Candidate Species	Baseline wildlife studies study included site surveys for individuals and suitable habitat for potential threatened, endangered, and candidate species, as required by the USFWS. Access to the radiation control areas, which may contain toxic and/or radioactive constituents, would be controlled by fencing (8 foot chain-link) to exclude access to the public, wildlife, or livestock. (Plan of Operations §§ 1.5.3 (Federal Permits), 5.4.11 (Wildlife Habitat Rehabilitation), 6.5 (Monitoring - Wildlife), and 8.9 (Wildlife).	No measures are proposed.	FWS: Required to protect migratory birds and raptors; no consultation determined necessary at this time. WGFD: Consultation completed 2014; if off-site processing occurs further consultation may be necessary to ensure compliance with Wyoming. Executive Order 2011-05 for sage grouse. WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-9 (Wildlife); Project Overview § 2.3.2.3 (Federal Permits); Mine Plan § 3.10.5 (Wildlife Monitoring); and Reclamation Plan § 4.4.10 (Wildlife Habitat Rehabilitation).
Wildlife – Migratory Birds	Baseline wildlife studies study included site surveys for migratory birds, as required by the FWS. Ponds would be covered with bird balls to deter waterfowl. Project personnel would inspect the ponds on a daily basis to verify adequate coverage by bird balls, identify, record, and report any wildlife mortalities, and where possible,	MB-1: Surface disturbance in previously undisturbed areas and/or disruptive activities that have the potential to cause destruction of nests, eggs, or young of migratory birds would be prohibited during the period of May 1st to July 15th. A survey of the proposed disturbance areas would be conducted by the proponent to determine the presence/absence of nesting migratory birds. Nest surveys would be conducted	FWS: Required to protect migratory birds and raptors; no consultation determined necessary at this time. WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-9 (Wildlife); Project Overview § 2.3.2.3 (Federal Permits); Mine Plan § 3.10.5 (Wildlife Monitoring); and Reclamation Plan § 4.4.10 (Wildlife Habitat Rehabilitation).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	implement measures to reduce or eliminate future occurrences. Annual raptor surveys. (Plan of Operations §§ 1.5.3 (Federal Permits), 5.4.11 (Wildlife Habitat Rehabilitation), 6.5 (Monitoring - Wildlife), and 8.9 (Wildlife).	no more than 7 days prior to surface disturbing and/or disruptive activities. If no nests, eggs, or young are identified in these areas by this survey, this measure would be waived. (Avoidance) MB-2: All open pipes would be screened, capped, or filled to prevent birds from becoming trapped; all exhaust stacks would be screened to prevent bird entry and discourage perching, roosting, and nesting. Caps would be checked regularly. (Avoidance) MB-3: In consultation with the BLM, the WGFD, and the FWS, approaches to minimize bird presence on the Heap Leach Pad and exposure to sulfuric acid and sodium chlorate would be explored. If an approach is identified during the required consultation and is implemented, bird death impacts would be minimized. (Minimization) MB-4: New power lines would be constructed to meet or exceed the 2006 and 2014 APLIC Standards and bird deterrents should be installed on existing power lines. (Avoidance) MB-5: Sides of all water/fluid impoundments, including sediment ponds, would be sloped enough to allow animals to escape. (Minimization)	
Wildlife – BLM and Wyoming Special Status Species	Baseline wildlife studies study included evaluation of the presence of special status species.	**All BWSS measures are recommended mitigation measures ONLY and ARE NOT REQUIRED.**	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-9 (Wildlife); Project Overview § 2.3.2.3 (Federal Permits); Mine Plan § 3.10.5 (Wildlife Monitoring); and Reclamation

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	Access to the radiation control areas, which may contain toxic and/or radioactive constituents, would be controlled by fencing (8 foot chain link) to exclude access to the public, wildlife, or livestock. (Plan of Operations §§ 1.5.3 (Federal Permits), 5.4.11 (Wildlife Habitat Rehabilitation), 6.5 (Monitoring - Wildlife), and 8.9 (Wildlife).	BWSS-1: All garbage would be collected and managed on-site appropriately then removed from the Project Area at frequent intervals (at least every 2 weeks) to avoid attracting scavengers and avian predators to the area. (Minimization) BWSS-2: Newly constructed aboveground structures that can serve as perching and nesting sites for corvids and raptors would be equipped with anti-perching devices. Anti-perching devices would also be installed on all existing power line poles and cross-arms on a case by case basis if not already in place. (Avoidance) BWSS-3: New and existing 3- or 4-strand wire fences would have markers or reflectors to increase visibility for low-flying greater sage-grouse. All new fences would be Type E fences. (Minimization) BWSS-4: All water/fluid impoundments capable of providing a medium for mosquito reproduction would be monitored for mosquito larvae. If mosquito larvae in water/fluid impoundments are present, mosquito control would be initiated immediately. (Rectification) BWSS-5: If off-site processing occurs, Energy Fuels would be required to implement procedures to ensure employees adhere to appropriate speed	Plan § 4.4.10 (Wildlife Habitat Rehabilitation).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
		limits within the Project Area and on public roads outside of the Project Area where speed limits are not posted to limit noise and dust produced by trucks travelling on the road during the greater sage-grouse breeding and nesting season. (Minimization) BWSS-6: If off-site processing occurs, Project-related truck traffic in Core Area during the greater sage-grouse nesting/breeding season would only be allowed between 9 am and 6 pm daily to prevent Project-related noise from detection or exceeding ambient noise at lek perimeters. (Avoidance) BWSS-7: If off-site processing occurs, baseline measurements of ambient noise at lek perimeters facing the Crooks Gap/Wamsutter Road would be made to determine levels of risk to each active lek within 2 miles of the road. If noise levels are anticipated to exceed regulatory thresholds 10dB above ambient at the lek perimeter, the WGFD would need to be consulted to determine appropriate mitigation measures.(Minimization) BWSS-8: The BLM may determine if monitoring limber pines that are not infected with WPBR warrant testing to determine WPBR resistance. If so, BLM would recommend that unaffected trees be protected from natural and human disturbance until the determination is made. If resistant, limber pine cones could be used in re-establishing	

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
		populations. Alternatively, BLM may determine that transplanting some of the healthy limber pine trees to previously disturbed areas within the Project Area would be effective reclamation in those sites. (Minimization) BWSS-9: To protect breeding raptor species, Energy Fuels would avoid all existing raptor nest sites and surface-disturbing activities during the breeding season (February 1 to July 31 for golden eagles, April 1 to September 15 for burrowing owls, and February 1 to July 31 for all other raptors) within applicable nest protection buffers (i.e., 1 mile for ferruginous hawk and golden eagle or 0.75 mile for all other raptors, unless site-specific, species-specific distances are determined and approved by the BLM). Because a number of variables (e.g., nest location, species' sensitivity, breeding, phenology, topographical shielding) would determine the level of impact to a breeding pair, appropriate protection measures, such as seasonal constraints and establishment of buffer areas, would be implemented at active nest sites on a species-specific and site-specific basis, in coordination with the BLM. This measure would only apply to operations beginning within these sensitive time frames and within the sensitive buffer areas. It would not apply to ongoing operations continuing through the active breeding season. (Avoidance)	

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
Wildlife – General	Baseline wildlife studies included file and data surveys, site surveys for individuals and habitat evaluation. Access to the radiation control areas, which may contain toxic and/or radioactive constituents, would be controlled by fencing (8 foot chain link) to exclude access to the public, wildlife, or livestock. (Plan of Operations §§ 5.4.11 (Wildlife Habitat Rehabilitation), 6.5 (Monitoring - Wildlife), and 8.9 (Wildlife).	W-1: Energy Fuels would be required to implement procedures to ensure employees adhere to appropriate speed limits within the Project Area and on public roads outside of the Project Area where speed limits are not posted to minimize big game-vehicle collisions. (Minimization) W-2: Human activity on the east slope of Sheep Mountain, at the Sheep I Shaft, would be minimized to the extent practicable as to not compromise the safety of the mine from November 15 to April 30 to reduce impacts to wintering mule deer. (Minimization) W-3: Fences would be monitored for any wildlife mortalities, including big game. (Minimization) W-4: Wildlife-friendly fencing would be placed around reclaimed areas to facilitate reclamation success. Fences installed for reclamation purposes would conform to BLM's standard fence type (3-wire, 2 barbed, bottom smooth) to facilitate animal migration. Unnecessary existing fencing would be removed to reduce wildlife hazards. (Avoidance) W-5: Dust control would be applied along Crooks Gap/Wamsutter Road in consultation with the appropriate county transportation department to reduce effects to roadside vegetation/habitat. (Minimization)	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-9 (Wildlife); Mine Plan § 3.10.5 (Wildlife Monitoring); and Reclamation Plan § 4.4.10 (Wildlife Habitat Rehabilitation).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
		W-6: Through consultation between NRC and BLM, the perimeter of the chain-link fence surrounding the NRC Restricted Area would be checked frequently, depending on initial observations, for any signs of mammal or reptile presence. (Minimization) W-7: Through consultation between NRC and BLM, if signs of small mammal and reptile presence are detected within the NRC Restricted Area (animal presence, carcasses, feces, burrows), a fine mesh wire fence or hardware cloth apron extending 2 feet below the ground surface would be buried around the outside perimeter of the chain-link fence to minimize or eliminate burrowing animals from entering the area. Fine mesh fencing extending to 3 feet above ground around the inside perimeter of the chain-link fence would be placed to prevent smaller, ground-dwelling wildlife (i.e., ground squirrels, chipmunks, and other rodents, lizards, and snakes) from entering tailings cells and evaporation ponds. (Minimization)	
Wild Horses and Burrows	Baseline wildlife survey included big game monitoring (including wild horses and burros). (Plan of Operations § 8.9 (Wildlife)).	WHB-1: The Congo Pit highwalls would be fenced to more effectively decrease potential falls, entrapments, or other impacts. (Avoidance)	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-9 (Wildlife); and Mine Plan § 3.1056 (Wildlife Monitoring).
Cultural Resources	Baseline archeological survey conducted to document existing conditions. Energy Fuels proposes to install signage along Big Eagle Road or Crooks Gap/Wamsutter Road adjacent to the Project	CR-1: To minimize unauthorized collecting of archaeological material or vandalism to known archaeological sites, Energy Fuels and their contractors, and all construction personnel, would attend mandatory	SHPO: Consultation completed 2012; no additional consultation necessary. Interested Tribes: Consultation completed 2012 under Section 106 of the NHPA.

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	Area during construction of the Ore Processing Facility that provides a historical overview of uranium mining in the Crooks Gap area. (Plan of Operations § 8.3 (Archeology))	training and be educated on the significance of cultural resources and the relevant federal regulations intended to protect them. (Minimization) CR-2: In accordance with 43 CFR § 3809.420 Performance Standards, if unknown cultural resources are found during project activities, Energy Fuels would suspend all activities that further disturb such materials and immediately contact the BLM AO. Project activities would not resume until authorization to proceed is issued by the BLM AO. Energy Fuels would be responsible for the costs of evaluation and any necessary mitigation. (Minimization) CR-3: To prevent impacts through physical avoidance and protection during construction, Site 48FR7357 would be isolated with temporary construction fencing, under the on-site guidance of a BLM-approved archaeologist. If physical avoidance is not possible, interpretive signage would be developed and installed along public roads by Energy Fuels in coordination with the BLM. (Avoidance)	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-3 (Archeological and Paleontological Resources - Confidential) and Project Overview §§ 2.6 (Protection of Other Resources).
Paleontological Resources	No measures are proposed.	P-1: In accordance with 43 CFR § 3809.420 Performance Standards, if suspected fossil materials are uncovered during construction, Energy Fuels would suspend all activities in the vicinity of such a discovery and notify the BLM AO as soon as possible. Work in this area would not continue until notified to proceed by the BLM AO. The BLM AO would evaluate, or would have	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-3 (Archeological and Paleontological Resources - Confidential).

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
		evaluated, such discoveries not later than 5 working days after being notified, and would determine what action shall be taken with respect to such discoveries. The decision as to the appropriate measures to mitigate adverse effects to significant paleontological resources would be made by the BLM AO after consulting with Energy Fuels. Energy Fuels would be responsible for the cost of any investigations necessary for the evaluation, and for any mitigative measures. (Minimization)	
Tribal and Native American Religious Concerns	No measures are proposed.	TNA-1: In the event that properties of traditional religious and cultural significance to Indian tribes were discovered during Project activities, Energy Fuels would stop working in that area and notify the BLM AO. Work would continue in that area with approval of the BLM. Energy Fuels would be responsible for the costs of evaluation, tribal consultation, and any necessary mitigation. (Minimization)	SHPO: Consultation completed 2012; no additional consultation necessary. Interested Tribes: Consultation completed 2012 under Section 106 of the NHPA.
Socioeconomic	The Project's staggered development schedule over 5 years would limit annual population increases in Fremont and Carbon counties and allow local communities to adjust to potential population changes. (Plan of Operations § 1.5 (Project Schedule)).	SE-1: To ensure that health, safety, and community service needs are addressed, Energy Fuels would maintain active and open communication with governmental entities (including counties, municipalities, and small towns such as Jeffrey City, Bairoil, and Wamsutter) throughout the life of the Project. (Minimization)	No measures are required.
Environmental Justice	No measures are proposed based on lack of disproportionately high and adverse human health or environmental effects of programs, policies, and activities on minority and low-	No measures are proposed.	No measures are proposed.

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	income populations.		
Transportation/ Access	On-site haul roads would be crowned and ditched to quickly shed any direct precipitation, and culverts would be installed to convey runoff from first and second order drainages that are crossed by the haul road. Berms reaching the midpoint of the wheel of the largest equipment on site would be installed in any area where the potential for equipment tipping exists. Off-road water trucks would provide dust control and water to aid in compaction of the surface. Energy Fuels would coordinate with the Wyoming Department of Transportation (WYDOT), Fremont County, and in the event of off-site processing, Sweetwater County and the BLM so that use of state highways and county and BLM roads is consistent with issued use permits, rights-of-ways, and other state and county requirements. (Plan of Operations §§ 3.1.1 (Site Access), 3.2 (Open Pit Development))	TRA-1: If on-site processing occurs, Energy Fuels would be required to identify and reclaim or enhance the reclamation of a portion of ground within the Project Area equal to the area to be removed from the public domain and transferred to the State of Wyoming or the DOE. (Rectification) TRA-2: Energy Fuels would be required to obtain agreements with appropriate county transportation departments or other road owners for which use is proposed. In particular, if off-site processing were to occur, agreements with appropriate counties would be required for hauling along the Crooks Gap/Wamsutter Road. (Minimization)	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Mine Plan §§ 3.3.3.1 (Spoils Facility Construction) 3.3.4 (Haul Roads), 3.5.4 (Access Roads), 3.5.5 (Site Security); and Reclamation Plan § 4.3 (Ancillary Facilities). WYDOT: permits required for hauling of oversized, overlength and overweight loads on State highways. Fremont and Sweetwater Counties: road use, involvement, and maintenance agreements would be required as appropriate.
Radiological Exposure	Baseline radiological survey conducted to document existing conditions. Workers would be protected through MSHA regulations, as well as the Wyoming State Mine Inspector's Office, which establishes maximum exposure levels of radon and radon-daughter products. For the Heap Leach Pad, under NRC regulations (10 CFR § 20), workers would be limited to an annual radiation exposure limit	No measures are proposed.	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-11 (Radiological Assessment); Mine Plan §§ 3.8.2 (Selective Handling), 3.10.1 (Air Quality and Radiation Level Monitoring) Monitoring; and Reclamation Plan § 4.4.3 (Materials Handling and Regraded Overburden Monitoring). NRC: Processing Facility only; Source and Byproduct Materials License; not submitted; Off-site processing facility source and byproduct materials license currently in standby status (to

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	of 5,000 mrem/year. USDOT regulations require that the ore trucks be tarped and checked for radiation levels prior to leaving the mine site and the ore processing site on the return leg. In the event of an accident resulting in an ore spill, the spilled material and surrounding area would be cleaned up to background levels. Cleanup levels would be verified using a gamma meter or similar instrument. Energy Fuels' company policies require that all scrap metal and other recyclables be checked with an appropriate meter prior to leaving the mine site. If radiation levels were found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards. (Plan of Operations §§ 5.4.3 (Materials Handling), 6.2 (Air Quality and Radiation Levels), 6.9 (Personnel and Workplace Monitoring), and 8.10 (Radiology).		update would require further action by the NRC; no current plans to update). EPA: Permit for construction of underground mine under 40 CFR § 61 Subpart B (radon emissions), monitoring required.
Hazardous Materials and Waste	Spill response measures are outlined in the Spill Contingency Plan. Non-Hazardous: Non-hazardous materials would be recycled or disposed of off-site at a licensed facility. Hazardous: Spilled fuel, used oil, used antifreeze, and other liquid wastes from maintenance operations would be recycled and/or disposed off-site at a licensed facility. All hazardous waste would be disposed of or	No measures are proposed.	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Tables 2.1 (Regulatory Permitting requirements) and 2.2 (Other Regulatory Requirements), and Mine Plan § 3.7.6 (Solid Waste Disposal). NRC: Processing Facility only; Source and Byproduct Materials License (would likely include measures to manage hazardous materials or waste); not submitted; Off-site processing facility source and byproduct materials license currently in stand by status (to update would require further action by NRC; no current plans to

Resource	Applicant Committed Mitigation Measures (Proposed Action)	Additional BLM Proposed Mitigation Measures (BLM Mitigation Alternative)	Other Agency Permit or Required Measure (Considered Applicant Committed Measure for analysis purposes)
	recycled in accordance with state regulations and, in some cases, landfill-specific requirements. Plan of Operations § 4.7 (Spill Contingency Plans).		update). Fremont County: Building permit would be required for any new septic or sewage systems.
Recreation	Existing land uses, including recreational opportunities such as hunting and fishing, were identified during baseline surveys. The post-mining land use, outside of the On-Site Ore Processing Facility, will be similar to the pre-mine land use, including recreational opportunities. (Plan of Operations §§ 6.5 (Vegetation) and 8.1 (Land Use)).	REC-1: Energy Fuels would be required to inventory roads which currently or could during development access hazardous areas of the mine and pose safety hazards for hunters or recreationists during operations. These roads would be reclaimed and/or blocked off during operations reducing safety risks to hunters or recreationists. (Rectification)	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Appendix D-1 (Land Use); and Project Overview § 2.7.6 (Land Use).
Livestock Grazing	Existing land uses, including grazing, were identified during baseline surveys. The post-mining land use, outside of the On-Site Ore Processing Facility, will be similar to the pre-mine land use, including recreational opportunities. (Plan of Operations §§ 6.5 (Vegetation) and 8.1 (Land Use)).	See WHB-1 and W-4.	WDEQ-LQD Permit to Mine 381C, as approved July 2015: Project Overview §§ 2.6 (Protection of Other Resources) and 2.7.6 (Land Use).

2.5 NO ACTION ALTERNATIVE

Under this Alternative, the BLM would deny Energy Fuels' Plan of Operations as proposed. Therefore, the BLM would be denying the proponent's right to extract minerals on federal lands from their mining claims. The selection of the No Action Alternative may constitute a taking because it violates valid existing rights under the U.S. Mining laws (as amended) and may result in legal action by the proponent. For these reasons the selection of the No Action Alternative is unlikely, but is described in this document in order to satisfy the requirements under NEPA.

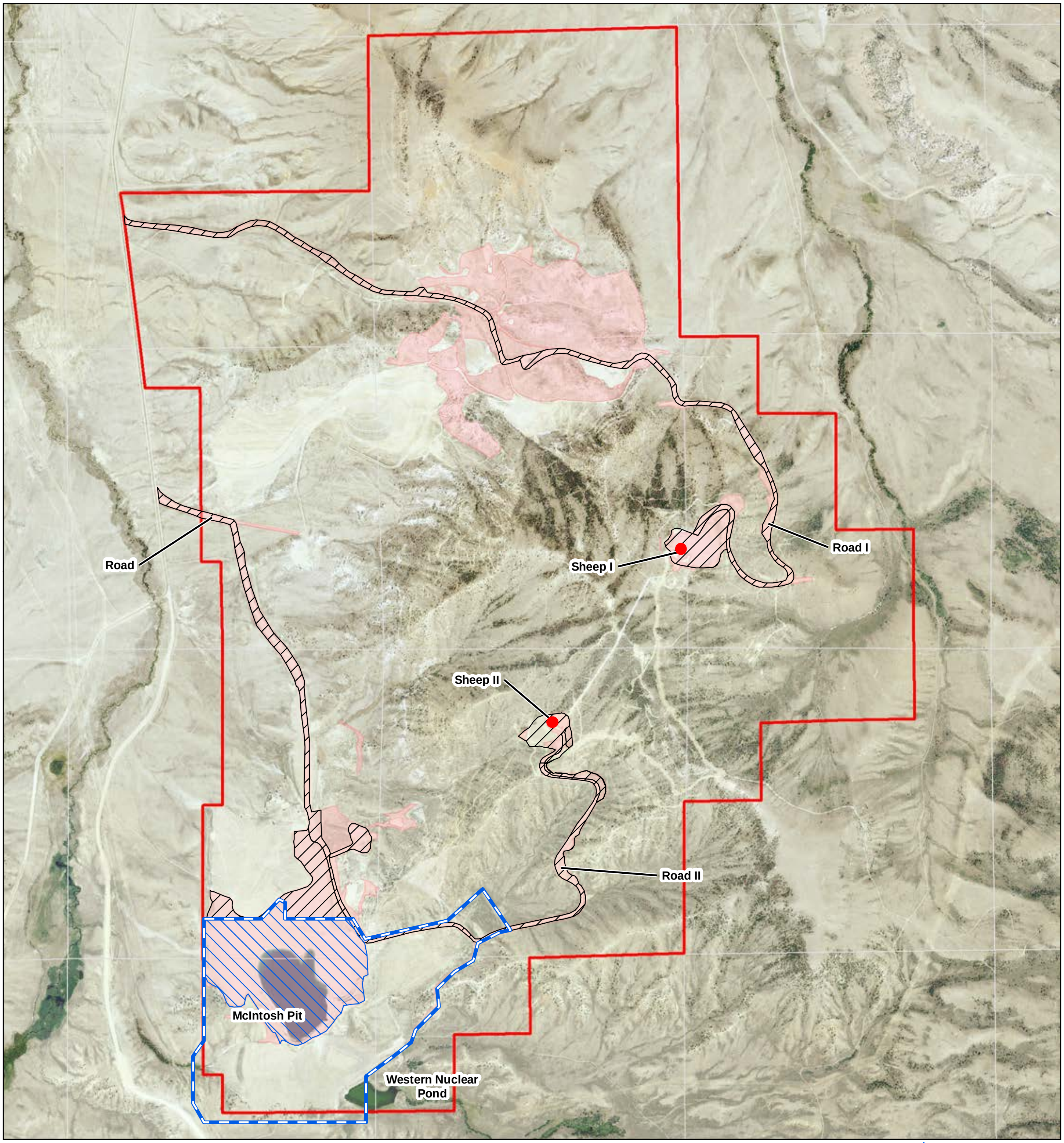
Undisturbed lands occur within the Project Area and would remain undisturbed under the No Action Alternative. There are also lands that were disturbed by prior mining, and the reclamation that would take place on these lands under the No Action Alternative would depend upon when the disturbance took place, the mining and reclamation laws in place at the time of the disturbance, and whether reclamation was completed (Section 2.2.2.2).

The proposed Project is entirely within an active mine permit, WDEQ-LQD Permit to Mine 381C, and in accordance with the Permit and associated reclamation bond, Energy Fuels is obligated to complete certain reclamation under any Project alternative including the No Action Alternative (see Map 2.5-1). Within the Project Area, approximately 420 acres are currently disturbed. Of this, 144 acres are currently bonded for reclamation under WDEQ-LQD Permit to Mine 381C, as outlined in Section 2.5.1, below. Another 190 acres of the existing disturbance were disturbed prior to existing mining and reclamation laws, and Energy Fuels has no reclamation obligation for these lands. There would be no additional disturbance or reclamation of these lands unless WDEQ-AML made the decision to reclaim these lands, primarily due to safety concerns. WDEQ-AML is currently reclaiming a portion of the existing disturbance to address concerns associated with the McIntosh Pit, as outlined below. The WDEQ-AML work on the McIntosh Pit, for which BLM completed an Environmental Assessment (BLM, 2014b), would take place under any alternative including the No Action Alternative. Further, it would be assumed under the No Action Alternative that the Sweetwater Mill would continue to remain in its current stand-by status with no foreseeable future activities, changes, or modifications.

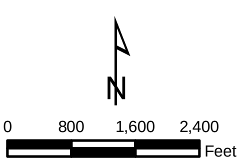
Map 2.5-2 shows the locations of the 675.8 acres that were disturbed and reclaimed by prior operators, including USECC, Western Nuclear, Titan, and Energy Fuels. Under the No Action Alternative, there would be no additional disturbance or reclamation of these lands. Map 2.5-2 also shows the locations of the 215.9 acres that were reclaimed by WDEQ-AML, and under the No Action Alternative, no additional disturbance or reclamation of these lands would occur.

2.5.1 Energy Fuels Reclamation

Existing infrastructure within the WDEQ-LQD Permit to Mine 381C Permit Area includes approximately 6.5 miles of roads connecting all previously constructed components of the Project, an overhead power line, and ancillary buildings (office, dry room, and storage). Partially under an existing right-of-way and partially under a new temporary right-of-way from the BLM, Energy Fuels constructed an 8-inch diameter, HDPE temporary surface dewatering pipeline from the Sheep I Shaft to the McIntosh Pit, passing by the Sheep II Shaft. The 34.5/19.9 kilovolt (kV) overhead power line was installed during the fall of 2011 along an existing right-of-way and supplies power to run the dewatering pumps.

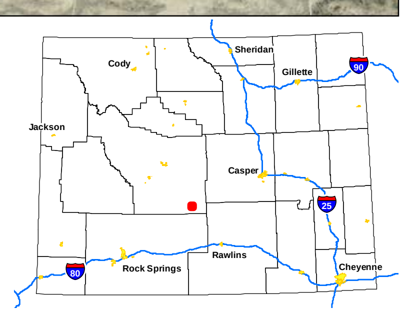


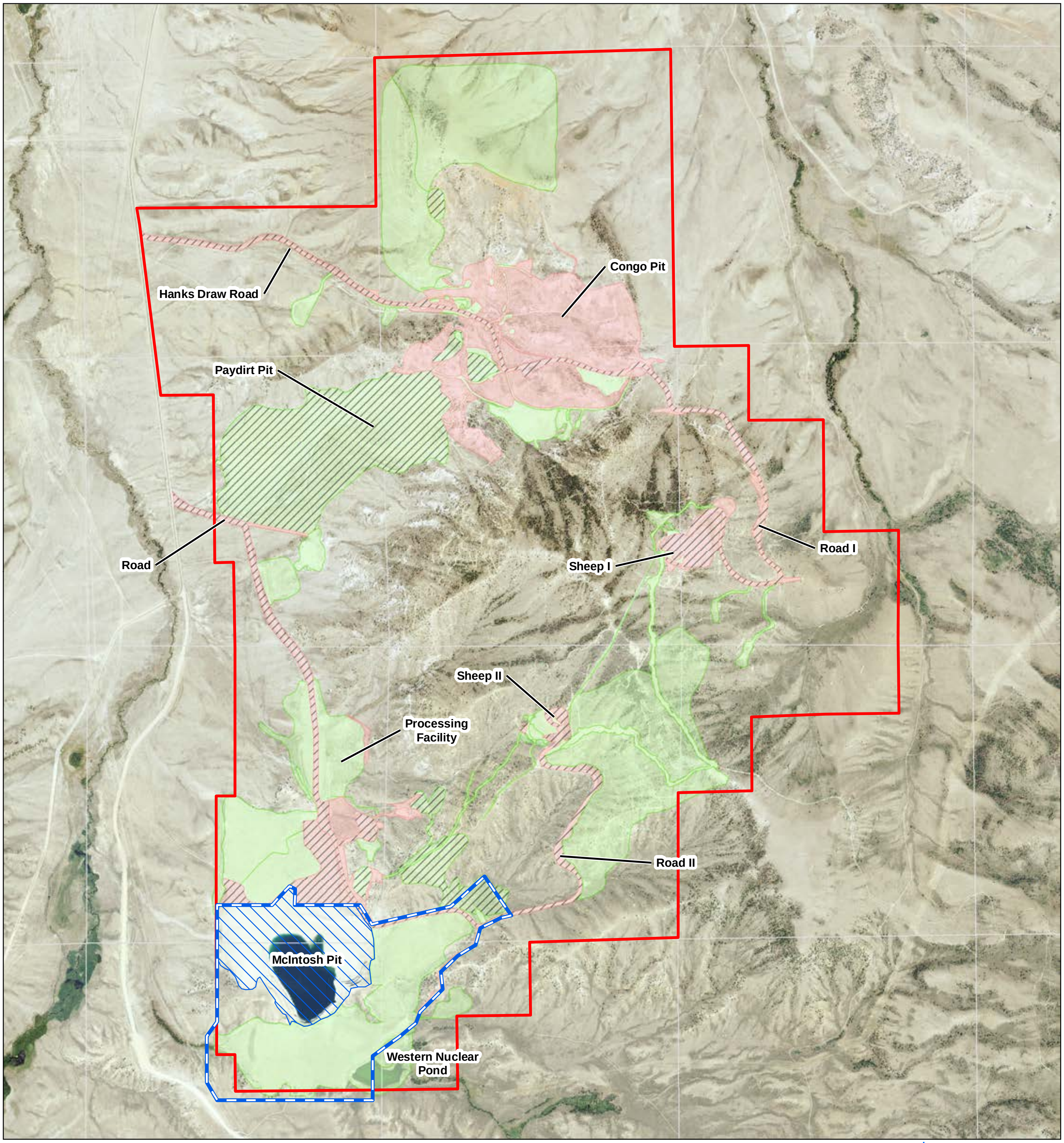
Map 2.5-1
No Action Alternative

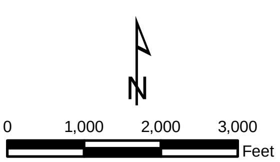


No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

Sheep Mountain Project Area
Disturbance Bonded for Reclamation (144 acres)
Existing Disturbance (420 acres)
AML Project 16-O Boundary (302 acres)
WDEQ-LQD Permit 381C Lands to WDEQ-AML (105 acres)



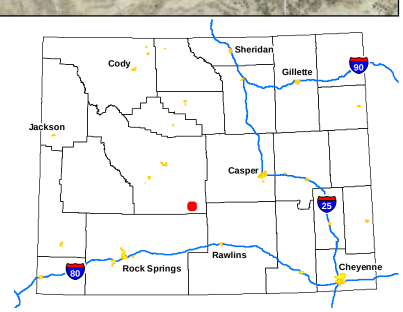




No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

Map 2.5-2
Current Reclamation Status

- Sheep Mountain Project Area
- Existing Disturbance - Not Bonded (190 acres)
- Existing Disturbance - Bonded for Reclamation (144 acres)
- Reclaimed Disturbance - by Others (676 acres)
- Reclaimed Disturbance - by AML (216 acres)
- AML Project 16-O Boundary (302 acres)
- WDEQ-LQD Permit 381C Lands to WDEQ-AML (105 acres)



The current mine reclamation commitments that would occur under the No Action Alternative include:

> **Sheep Declines.** The Big Sheep and Little Sheep unfinished declines would be sealed, and the Sheep Declines Shops would be removed. Spoil facilities would be removed and the area around the declines would be regraded and seeded. The declines would be sealed by installing a permanent concrete bulkhead backfilled to the surface.
>
> **Access roads.** The main road to the Sheep Declines Shop and McIntosh Pit up to the Sheep II Shaft would be reclaimed. Additionally, the Hanks Draw Road up to the Sheep I Shaft would be reclaimed.
>
> **Sheep I and II Shafts.** Energy Fuels has placed a permanent surface cap over both the Sheep I and Sheep II shafts that allows for monitoring, ventilation, and dewatering. The Sheep II Shaft area has been reclaimed to the standards consistent for mining, but additional work would be done under the No Action Alternative (final regrading and seeding). Sheep I spoils would be removed and the site reclaimed.
>
> **The McIntosh Mine Shops.** In 2011, the mine shops were demolished, all material removed, and the solid waste facility was excavated and removed. Sellable scrap metal was salvaged and all other solid waste was properly disposed of off-site at the Fremont County facility.

2.5.2 WDEQ-AML Reclamation of the McIntosh Pit

WDEQ-AML determined that reclamation of the McIntosh Pit would reduce safety risks associated with the pit by: reducing hazardous highwalls; eliminating the poor quality water body in the flooded pit; encapsulating those mine spoils which had elevated radiological components; establishing geomorphically stable landforms; and reestablishing a flow-through drainage system (BLM, 2014b). In addition, the work on the McIntosh Pit could be done in conjunction with work on the Western Nuclear Pond to improve the function of that reservoir.

WDEQ-AML began work on McIntosh Pit in 2014 (WDEQ-AML Project 16-O), and expects to complete work by 2020. Originally, Energy Fuels had a reclamation obligation for 105 acres under WDEQ-LQD Permit to Mine 381C to reduce a portion of the pit highwalls (see Map 2.5-1). For more efficient coordination of the work, Energy Fuels' bond obligation for this work was addressed through a cooperative agreement between WDEQ-AML, Energy Fuels, and WDEQ-LQD.

In addition to highwall reduction, the WDEQ-AML work will improve the function of Western Nuclear Pond, which is managed by the WGFD for recreational use (fishing and hunting), as well as being used for livestock watering. This pond collects surface water from approximately 2,300 acres, and as a result, the pond maintains a pool year-round except during prolonged drought. The work on the McIntosh Pit will restore drainage from an additional 414 acres to Western Nuclear Pond, and the additional water will provide protection against drought impacts (BRS Engineering - BRS, 2014). An illustration of the reclaimed surface once the WDEQ-AML work is completed is shown on Figure 5.3-1 in Chapter 5.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

2.6.1 Mining Alternative (In-Situ Recovery)

In-situ leaching (ISL), also known as in-situ recovery (ISR), consists of injecting a leaching solution into porous uranium-bearing strata through a series of injection wells. Once in contact with the mineralization, the leach solution or lixiviant oxidizes the uranium minerals, which allows the uranium to dissolve in the groundwater. Production wells, located between the injection wells, intercept the uranium-bearing lixiviant and pump it to the surface. At the surface, a centralized ion exchange facility extracts the uranium from the lixiviant. Once the ion exchange resin is fully loaded with uranium, it is stripped or eluted. The uranium is then precipitated from the eluate as yellowcake slurry, dried, and packaged.

Although a sulfuric acid solution is allowed and used as the lixiviant in some countries, ISR operations in the United States typically add dissolved oxygen and carbon dioxide to the native groundwater to produce a weak alkaline lixiviant. This results in less environmental impact to the groundwater. Testing of the ores at Sheep Mountain indicate that uranium recovery would be very limited through use of a weak alkaline lixiviant in comparison to a sulfuric acid heap leach. ISR systems are considerably less expensive to install and operate than a conventional mining and ore processing operation.

ISR is currently the most common form of uranium recovery in the United States; however, it is dependent on amenable mineralogical and hydrological conditions. The Sheep Mountain ores are mineralogically and geochemically amenable to ISR methods; however, the hydrologic conditions are not, and this renders ISR processes impractical.

Much of the uranium in the sandstone beds in the Battle Spring Formation is above the water table or in an unconfined aquifer, which limits reasonable hydrologic control of the ISR process fluids during the uranium recovery process. Without adequate control of the ISR process fluids, the required control of the lixiviant associated with the ISR process is not reasonably achievable. Without this, protection of public health, safety, and the environment under operational and post-operational conditions cannot be reasonably assured.

The State of Wyoming would likely require setback of ISR mining areas from historical underground and open pit mine workings in order to ensure that ISR recovery fluids are not lost due to preferential flow through historical workings. Because there are extensive historical underground and reclaimed open pit workings in the Project Area, application of ISR methods would not be practical technically or consistent with State of Wyoming requirements. This alternative was eliminated from further consideration.

2.6.2 Milling Alternatives

2.6.2.1 Alternative On-site Processing Facility Locations

Due to the relatively rugged topography and small amount of flat area within the WDEQ-LQD Permit to Mine 381C permit boundary, only two locations were considered for on-site ore processing; the Proposed Action location and the Paydirt Pit area. The Paydirt Pit area is located near the proposed Congo Pit and the Sheep Underground decline portal. This area consists of fairly rougher terrain than the proposed processing facility location, and the proposed processing facility location overlaps more existing disturbed lands than the Paydirt Pit area. Also, the Paydirt Pit area consists of public lands managed by the BLM. In order to minimize new disturbance and grading costs, the proposed location was more amenable for a heap leach and processing facility. Also, transferring private lands to the State of Wyoming or DOE for long-term care and maintenance is generally a much easier process than transferring federal lands to the State of Wyoming or DOE. For these reasons, this alternative was eliminated from further consideration.

2.6.2.2 On-Site Conventional Milling

Conventional milling involves crushing and grinding of ore to create sand-like material in a slurry, and tank leaching and tailings separation of solids and liquids using counter current decantation tanks with tailings being pumped in a slurry to a lined disposal cell. Sulfuric acid would be used as the extraction solute (lixiviant) and SX would be the exchange process for stripping the uranium from the process solutions.

Conventional milling would require the addition of a screening and crushing circuit, leach tanks, and counter current decantation circuit requiring additional land disturbances. This could result in additional impacts to visual resources and surface water from increased sedimentation and stormwater.

Although there is no heap leach pad under this conceptual alternative, a fully lined tailings disposal cell of equal or greater footprint (40 acres) would need to be constructed in or near the same location as the propose Heap Leach Pad. This tailings disposal cell would contain not only the 10 million tons of tailings but millions of gallons of tailings fluid that would maintain an operating head on the primary liner of many tens of feet rather than the few feet designed into the Heap Leach Pad. The Holding Pond for management of liquid wastes and process area stormwater would be retained under this conceptual alternative, but the Collection Pond and Raffinate Pond would be eliminated from the design. However, the tailings impoundment could contain a tailings pool (standing tailings liquid), which could be between 20 to 30 acres at peak operating conditions. There would be higher evaporative water loss (and commensurate water consumption to replace these losses) as well as greater opportunity for potential wildlife exposure. In addition, the increase operating head on the tailings cell liner would increase potential for impacts to groundwater from potential liner failure.

Conventional milling would require additional capital costs and increase operating costs due to increased labor and power requirements to operate the crushing, leaching, and counter current decantation circuits. These increased costs would reduce the return on investment for Energy Fuels and its stockholders to the point where the economic viability of the project would not be sufficient to attract investment capital. Because of the relative close location of an existing and fully permitted conventional mill (the Sweetwater Mill), Energy Fuels did not pursue construction of an entirely new mill to complete the same milling activities that could occur at the Sweetwater Mill. For the reasons given above, this alternative was eliminated from further discussion.

2.6.2.3 Alternate Access Routes to Sweetwater Mill

Although the BLM has no jurisdiction to limit use of County or State managed roads, two alternate haul routes to the Sweetwater Mill were considered but not carried forward for analysis. The first alternate route is north on Crooks Gap/Wamsutter Road, east on US Highway 287 to Muddy Gap, south on US Highway 287 to Minerals Exploration Road (also BLM 3206 and County Road 63), west on Minerals Exploration Road to Sweetwater Mill entrance, and north on access road to the Sweetwater Mill. This alternate haul route was eliminated from further consideration because it is approximately 60.4 miles longer than the route described in the Proposed Action; it poses greater health and safety risks because it would require travel on

US Highway 287 for approximately 52 miles with a higher possibility for human contact and collisions; and it passes within 0.6-mile of two greater sage-grouse leks (the proposed route passes within 0.6-mile of only one greater sage-grouse lek). This route passes through Core Population Area (Core Area) for 56.7 miles whereas the proposed route passes through Core Area for 22.9 miles. Although this route utilizes more paved roads than the proposed route, it is assumed that dust suppression would be implemented and would minimize impacts to greater sage-grouse habitat. For these reasons, there are no anticipated overall benefits to greater sage-grouse as compared to the Proposed Action.

The second alternate haul route is north on Crooks Gap/Wamsutter Road, east on US Highway 287 to Muddy Gap, south on US Highway 287 to Wyoming State Highway 73, west on Wyoming State Highway 73 to where it becomes County Road 22 (Bairoil Road), continuing to the junction with Crooks Gap/Wamsutter Road, south on Crooks Gap/Wamsutter Road to Minerals Exploration Road, east on Minerals Exploration Road to the access road to the Sweetwater Mill. This alternate haul route was eliminated from further consideration because it is approximately 44.8 miles longer than the route described in the Proposed Action, and, similar to the alternate route described above, it poses greater health and safety risks and passes within 0.6-mile of five greater sage-grouse leks. This route also passes through Core Area for 60.6 miles – resulting in no benefit to greater sage-grouse as compared to the Proposed Action.

2.6.2.4 Ablation Technology

Ablation is a new technique that separates uranium-bearing minerals from its host rock using high pressure water nozzles. In ablation, uranium-bearing ore is crushed and screened and mixed with water to form slurry. Slurry is pumped through opposing injection nozzles generating a high energy impact zone where the uranium-bearing minerals are detached from the host material. The resulting slurry stream is then screened or elutriated to separate uranium-bearing grains from the host rock grains. Further segregation of the grains through gravity separation decreases the size of the ore-bearing grains that would require further processing by approximately 95 percent. This technique has been recognized for quite some time but has not undergone enough testing to fully understand the associated impacts or cost effectiveness. Through rigorous testing and research, this technique might be utilized on future uranium mining projects, but due to the limited data available, ablation is not being analyzed as an alternative in this EIS.

2.6.3 Waste Management Alternatives

2.6.3.1 Deep Well Injection of Process Wastes from On-Site Ore Processing

Liquid process wastes would be generated if the On-Site Ore Processing Facility were built. The wastes would potentially contain material regulated by the NRC. It is estimated that the Proposed Action would produce approximately 50 gpm of liquid process waste stream to be managed and disposed of via evaporation in the Holding Pond with solid precipitates ultimately being disposed of in the heap (11(e)(2) byproduct material). Deep well injection is commonly used to dispose of liquid waste for ISR uranium operations that typically produce 150 gpm to 700 gpm. Both disposal methods (evaporation or deep well injection) require the use of holding ponds or storage tanks prior to disposal, and both methods are assumed to be equally durable and protective.

There is minimal incremental benefit between the evaporative/heap disposal method and deep well injection. In particular, for deep well injection, holding ponds would be required for temporary storage to allow for shut down of the deep wells for maintenance or repair while the plan remains in operation. The NRC requires that a surface impoundment, such as a holding pond, be designed, constructed, and maintained to prevent overtopping resulting from normal or abnormal operations, overfilling, wind or wave actions, rainfall, run-on, from malfunctions, and from human error. Because the holding pond is required, it would be used for evaporation under the Proposed Action. As a result, the cost of an injection well (or wells depending on individual well disposal capacity) would be in addition to that for the evaporation system. Therefore, this alternative was eliminated from further consideration.

2.6.3.2 In-Pit Tailings Disposal

The assessment of solid waste management alternatives is focused on alternative locations for tailings disposal because it is the most significant solid waste stream in terms of total volume, total radioactivity, and potential for air emissions and surface impacts. Under this alternative, the Congo Pit would be backfilled to approximately 6,825 feet above mean sea level (amsl) or approximately 25 feet above the groundwater surface. A new 40-acre double-lined disposal cell would be constructed on the floor of the partially backfilled pit. Tailings and other byproduct material from the decommissioning of the Ore Processing Facility would be trucked or conveyed to the new disposal cell in the Congo Pit. This alternative does not allow for deep burial of the tailings and byproduct material due to the shallow nature of the groundwater system in the area.

The final containment and reclamation of the heap is regulated by the NRC. The State of Wyoming or DOE would provide long-term care responsibilities. It is believed that the heap could not be replaced within the pit and meet NRC standards for mine tailings reclamation. Through Energy Fuels' analysis and design efforts, it was determined that the tailings would be too close to the elevated water table around the Congo Pit to permit this area as an alternative disposal facility. There would be approximately 25 feet between groundwater and any lined impoundments within the pit increasing the risk of compromising groundwater quality. This alternative has the potential for adverse impacts associated with re-handling and transporting more than 10 million tons of tailing and non-tailing 11(e)(2) byproduct material for more than 1 mile to the in-pit disposal facility which results in additional human exposure to radiological materials, increases transportation risk, and the potential for atmospheric suspension of dust and radio particulates. This alternative would result in less potential groundwater protection in the event of future liner failure. Therefore, this alternative was eliminated from further consideration.

2.6.4 Groundwater Management Alternative – Underground Injection of Excess Water from Dewatering Operations

As discussed in Section 2.3.11.2, some, but not all, of the water from dewatering of the Congo Pit can be used on site. The feasibility of disposing of the excess water into the Sheep Underground mine workings, (Underground Injection Control - UIC Permit), was evaluated as an alternative to treatment and surface disposal of the water, and the evaluation included a groundwater model of the proposed injection locations and rates. The results of the model indicated such injection would result in increased groundwater inflow rates into the Congo Pit, negating the efforts to dewater the pit. The increased inflow rates into the pit are due to the relatively low hydraulic conductivity of the Battle Spring Formation, especially compared to the interconnected underground workings. Because of the configuration of the workings, the water level rise in the Sheep I and II shafts is nearly equal, regardless of which shaft is used for injection, creating a broad mound that increases groundwater flow into the Congo Pit. Therefore, this alternative was eliminated from further consideration.

Disposal of excess water into wells drilled into a deeper formation aquifer or the Battle Spring Formation separate from the Sheep Underground Mine workings was also considered; however, this option is speculative because Energy Fuels does not consider it necessary at this time although it is included in the Plan of Operations. This is primarily due to the fact that the approved WYPDES Permit allows for a flow that will accommodate all anticipated discharge needs during dewatering operations. Assuming compliance with the approved WYPDES Permit, the BLM has no authority to require an alternative method of water disposal (unnecessary and undue degradation is prevented if Energy Fuels complies with the WYPDES Permit), nor does Energy Fuels have motivation to pursue other options. If this option is pursued by Energy Fuels in the future, a UIC Permit will be required which will include detailed information for analysis and allow for appropriate NEPA review at that time.

2.7 COMPARISON OF ALTERNATIVES

Table 2.7-1 provides a comparison of impacts associated with each of the alternatives.

Table 2.7-1
Comparison of Impacts

Resource	Proposed Action	BLM Mitigation Alternative	No Action
Amount of Disturbed Lands	Approximately 929 acres would be disturbed including 356.5 acres of new disturbance and 572.5 acres of re-use of previously disturbed area.	More areas would be reclaimed and reclamation would be better.	Some reclamation of existing disturbance (bonded areas) would be reclaimed.
Climate and Air Quality	Air pollutant concentrations resulting from construction and operations would be in compliance with the National Ambient Air Quality Standards (NAAQS) and Wyoming Ambient Air Quality Standards (WAAQS). Impacts from operations would be below PSD Class II increments, with the exception of short-term (24-hour) PM_{10} and $PM_{2.5}$ impacts which could exceed PSD increments. Impacts would not exceed the PSD Class I or Class II increments at any of the nearby Class I and sensitive Class II areas. In addition, impacts to air quality related values (AQRVs) (i.e., visibility, atmospheric deposition of nitrogen and sulfur, sensitive lakes) would be below applicable threshold values.	Impacts would be similar to the Proposed Action.	Impacts would be less than the Proposed Action.
Geologic Resources	Most impact. Changes to physiography and topography of the Project Area as mining progresses would result in direct impacts. Potential impacts related to geologic hazards such as slope stability, subsidence, seismic, and chemical hazards would be reduced by permitting and regulatory requirements.	Same as Proposed Action, but could have minor differences in the post-mine physiography due to the revised Reclamation Plan.	Least Impact. No change to physiography except those already anticipated as a result of existing operator reclamation requirements and WDEQ-AML reclamation plans.
Mineral Resources	Most impact. Direct impacts of the Project to mineral resources development are negligible because there are no directly overlapping proposals. Indirect impacts to mineral development could occur. The removal of 20 to 40 million pounds of uranium would occur.	Same as the Proposed Action, but additional mineral materials may be required if other areas outside of those identified for reclamation under the Proposed Action are determined to be reclaimed.	Least impact. No change in current mineral resource development and trends except those already anticipated as a result of existing operator reclamation requirements and WDEQ-AML reclamation plans.
Soils	Most impact. Disturbance of 929 acres across seven soil mapping units including 356.5 acres	Same as the Proposed Action. Impacts would be less with implementation of the	Least impact. Activities that would be conducted under

Resource	Proposed Action	BLM Mitigation Alternative	No Action
	of new disturbance and re-use of 572.5 acres. Mixing of topsoil and subsoil could occur as well as compaction resulting in direct impacts. Indirect impacts to soils could occur from wind and water erosion.	revised Reclamation Plan in accordance with the BLM Wyoming Reclamation Policy. The BLM LFO RMP standards would be fully implemented. Mitigation Measures would further reduce impacts.	Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C and the WDEQ-AML reclamation plan would positively benefit soils through the reclamation of currently disturbed areas.
Surface Water	Most impact. Disturbance within the Project Area could cause potential slight alterations of runoff patterns in ephemeral drainages resulting in indirect impacts. Potential for indirect impacts to surface water quality from sediment transport, spills and leaks, and dewatering discharge.	Same as the Proposed Action. Implementation of revised Reclamation Plan could provide more stable soils and less potential for erosion and sedimentation.	Least impact. No additional impact to existing surface water resources except those already anticipated as a result of existing reclamation plan in the WDEQ-LQD Permit to Mine 381C and the WDEQ-AML reclamation plans.
Groundwater	Most impact. Impacts to groundwater quantity and flow from mine dewatering and backfilling of the Congo Pit and Sheep Underground Mine. Impacts to groundwater quality through mineral oxidation and potentially spills and leaks.	Same as Proposed Action.	Least impact. No additional impacts to the existing groundwater resources except those already anticipated as a result of WDEQ-AML's reclamation of the McIntosh Pit which would eliminate evaporative loss of groundwater at the pit and reestablish the groundwater flow direction to the southwest rather than to the pit.
Water Use	No impact. May be reestablishment of flow-through drainages after reclamation.	Same as Proposed Action	No impact except those already anticipated as a result of existing reclamation requirements and WDEQ-AML reclamation plans.
Invasive, Non-Native Species and Noxious Weeds	Most impact. The Proposed Action would have the potential to allow establishment of invasive, non-native species and noxious weeds.	Same as the Proposed Action. Establishment of invasive, non-native species and noxious weeds would be reduced with implementation of Noxious Weed and Reclamation plans. Mitigation Measures would further reduce impacts.	Activities that would be conducted under Energy Fuels' reclamation plan in the WDEQ-LQD Permit to Mine 381C and the WDEQ-AML reclamation plan could

Resource	Proposed Action	BLM Mitigation Alternative	No Action
			potentially reduce invasive non-native species and noxious weeds.
Vegetation	Most impact. New disturbance of 356.5 acres of vegetation (including approximately 120 acres of Limber Pine-Big Sagebrush type vegetation and approximately 237 acres of Sagebrush-Grass type vegetation) and re-use of 572.5 acres of previously disturbed vegetation. Short-term, direct effects to herbaceous vegetation is expected. Direct effects to shrub-dominated and forest-dominated vegetation would persist for more than 10 years.	Less than Proposed Action. Long-term effects to vegetation would be reduced through implementation of a more stringent Weed Management Plan and revised Reclamation Plan dependent upon ecological sites and/or reference areas, reclamation potential, and area resource objectives. Mitigation measures would further reduce impacts.	Least impact. Activities that would be conducted under Energy Fuels' reclamation plan in the WDEQ-LQD Permit to Mine 381C and the WDEQ-AML reclamation plan would positively benefit vegetation through the reclamation of currently disturbed areas.
Wetlands and Riparian Zones	Most impact. Although negligible impacts to riparian vegetation along Crooks Creek would be anticipated.	Same as Proposed Action but additional reclamation might provide for less potential for erosion and sedimentation, which could benefit riparian vegetation along Crooks Creek.	Least impact. No additional impacts to wetlands and riparian zones except those already anticipated as a result of existing operator reclamation requirements and WDEQ-AML reclamation plans.
Wildlife - ESA-Listed, Proposed, and Candidate Species	No impact to ESA-listed species (blowout penstemon or Ute ladies' tresses orchid).	Same as Proposed Action.	No additional impacts other than those anticipated as a result of existing operator reclamation requirements and WDEQ-AML reclamation plans.
Wildlife - Migratory Birds	Most impact. Ground disturbance during peak nesting (May 15 to July 15) could result in nest abandonment, displacement of birds, and possible mortality of nestlings. Spatial and temporal limitations would lessen possibility of nest abandonment due to noise and human presence.	Less than the Proposed Action. Impacts would be similar to Proposed Action but would be less due to implementation of the Weed Management Plan and Mitigation Measures.	No additional impacts other than those anticipated as a result of existing operator reclamation requirements and WDEQ-AML reclamation plans.
Wildlife - BLM and Wyoming Special Status Species	Most impact. Disturbance of approximately 120 acres occupied by limber pine and approximately 4 acres of mapped Rocky	Less impact than the Proposed Action. Impacts would be similar to the Proposed Action but could be less due implementation	Least impact. Activities that would be conducted under Energy Fuels' reclamation

Resource	Proposed Action	BLM Mitigation Alternative	No Action
	Mountain twinpod potential habitat. Bats may be affected during construction. Most impact to greater sage-grouse. Potential indirect impacts to greater sage-grouse breeding, nesting, and early brood-rearing from March 15 through June 30 could occur by removal of habitat and increased noise. Potential impacts from corvids (nest predation and West Nile Virus).	of the Weed Management Plan and Mitigation Measures.	plan in the WDEQ-LQD Permit to Mine 381C and the WDEQ-AML reclamation plan would positively benefit sage-grouse habitat through the reclamation of currently disturbed areas.
Wildlife – General	Big Game and Trophy Game – Most impact. Direct impacts to Big Game animals would occur through removal of habitats. Increased potential for vehicle-related mortality and changes to animal movement patterns due to fences. Upland Game Birds, Small Game and Furbearers – Most impact. Direct impacts would occur through removal of habitats and increased traffic and an increased potential for effects from toxic and caustic compounds. Migratory Game Birds – Most impact. Potential impacts from exposure to chemicals used in the heap leach process. Non-Game Wildlife – Most impact. These impacts would be similar to those for Upland Game Birds, Small Game and Furbearers.	Less than the Proposed Action. Impacts would be similar to Proposed Action but could be reduced through implementation of Mitigation Measures.	No additional impacts other than those anticipated as a result of existing operator reclamation requirements and WDEQ-AML reclamation plans.
Wild Horses and Burrows	Most impact. Removal of forage within the Green Mountain HMA (302 acres of new disturbance and re-use of 208 acres) and additional fencing (NRC Restricted Area).	Same as the Proposed Action. Although impacts could be less with implementation of the Weed Management Plan.	Least impact. Some forage may be returned under current reclamation obligations.
Cultural Resources	Most impact. Although impact through destruction or loss of cultural resources considered to be low.	Same as the Proposed Action. Although Mitigation Measures would lessen any potential for unforeseen, or unanticipated impacts to cultural resources.	Least impact. Potential for impacting unidentified cultural resources during existing operator reclamation requirements and WDEQ-AML reclamation plans is minimized because activities

Resource	Proposed Action	BLM Mitigation Alternative	No Action
			would occur on existing disturbance.
Paleontological Resources	Most impact. Although impact through destruction or loss of fossils considered to be low.	Same as the Proposed Action. Although Mitigation Measures would lessen any potential for unforeseen, or unanticipated impacts to paleontological resources.	Least impact. Potential for impacting unidentified fossils during existing operator reclamation requirements and WDEQ-AML reclamation plans is minimized because activities would occur on existing disturbance.
Tribal and Native American Religious Concerns	No impact.	Same as the Proposed Action. Although Mitigation Measures would lessen any potential for unforeseen or unanticipated impacts to tribal and Native American religious resource concerns.	Least impact. Potential for impacting unidentified sites during existing operator reclamation requirements and WDEQ-AML reclamation plans is minimized because activities would occur on existing disturbance.
Socioeconomic	Moderate impact. Direct employment of 17 to 189 jobs per year during mining, and 6 to 24 jobs per year during closure. Secondary (indirect and induced) employment of 5 to 28 jobs per year during mining, and 3 to 8 jobs per year during closure. Potential population increase of 269 to 325 residents in Fremont and Carbon counties over 5 years. Fiscal impacts would include severance tax revenue to the State of Wyoming, property tax revenue to Fremont County, and sales tax revenue to counties and the state.	Same as Proposed Action.	No impact.
Environmental Justice	No disproportionate impact to minority or low-income populations.	Same as Proposed Action.	No impact.
Transportation/Access	Most impact. Increase in vehicle trips on affected roadways peaking between 40 and 61 vehicle round-trips per day during construction and between 55 and 107 vehicle round-trips per day during operations.	Same as the Proposed Action but impacts could be decreased with measures t to better manage and control access.	Least impact. Some existing roads would be reclaimed due to current obligations under existing permits.
Radiological Exposure	Radiological effects would be governed by the regulating authorities (i.e., NRC, EPA, MSHA)	Same as the Proposed Action.	No impact.

Resource	Proposed Action	BLM Mitigation Alternative	No Action
	and would be limited to those allowed by the applicable laws and regulations.		
Hazardous Materials and Waste	No impact other than from incidental spills.	Same as the Proposed Action.	No impact.
Recreation	Most impact. Direct impacts to recreationists could occur through removal or restriction of areas currently used for hunting within the Project Area. No impact to developed recreational facilities.	Less impact than the Proposed Action. Implementation of REC-1 could lessen impacts to recreational users.	Least impact. Opportunities for recreational users would increase as the area becomes less industrialized and wildlife habitat increases with reclamation, creating better opportunities for hunters.
Livestock Grazing	Most impact. Direct impacts to permittees could occur through removal of forage from 356.5 acres of new disturbance and re-use of 572.5 acres of previously disturbed areas across two grazing allotments (Mountain Allotment and Crooks Gap Allotment). No impact to range improvement sites. Potential for cattle to fall into the Congo Pit.	Less impact than the Proposed Action. Impacts could be less through implementation of the revised Reclamation Plan Increased forage could be available with implementation of a Weed Management Plan. Fencing of the Congo Pit highwalls would more effectively decrease potential falls, entrapments, or other impacts to livestock.	Least impact. Reclamation of existing operator reclamation requirements and WDEQ-AML reclamation plans could increase available forage in the Project Area.

Chapter 3.0
Affected Environment

3.1 INTRODUCTION

This Chapter provides a description of the human and natural environmental resources as they currently exist that could be affected by the Proposed Action and any of the other Alternatives. The environment described is the baseline for the comparisons in Chapter 4, Environmental Consequences. Table 3.1-1 provides a list of potentially impacted resources which are analyzed in this EIS.

Table 3.1-1
Potentially Impacted Resources

Resources	Not Present on Location	No Impact	Potentially Impacted
PHYSICAL RESOURCES			
Air Quality and Climate			X
Geological Resources			X
Mineral Resources			X
Soils			X
Floodplains	X	X	
Coastal Zone Areas	X	X	
Water (Surface, Groundwater, and Water Use)			X
Federal Water Reserve	X	X	
BIOLOGICAL RESOURCES			
Invasive, Non-native Species			X
Vegetation			X
Wetlands and Riparian			X
Special Status Species			X
Wildlife			X
Wild Horse and Burros			X
HERITAGE RESOURCES AND HUMAN ENVIRONMENT			
Cultural Resources: Property of historic, archeological, or architectural significance (including sites on or eligible for the National Register of Historic Places and the National Registry of Natural Landmarks			X
Paleontological Resources			X
Tribal and Native American Religious Concerns			X
Visual Resources		X	
Socioeconomic			X
Environmental Justice			X
Transportation/Access			X
Public Health and Safety			X
Wastes, Hazardous or Solid			X
LAND RESOURCES			
Prime or Unique Farmlands	X	X	
Recreation including travel management			X
Livestock Grazing			X
Realty Actions			X
Fire and Fuels		X	
Special Designations	X	X	

For those resources identified in Table 3.1-1 that are either not present or would not be impacted by the alternatives, clarifying information is provided below.

Visual Resources. The BLM visual resource inventory established Visual Resource Management (VRM) classes in the Project Area as VRM Class IV. All of the alternatives analyzed in the Final EIS for the Lander RMP manage the Project Area as VRM Class IV (BLM, 2013a). The VRM Class IV objective is: “Provide for management activities which require major modification to the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt will be made to minimize the activities through careful location, minimal disturbance, and repeating the basic elements” (BLM, 1986).

The natural features of the characteristic landscape have been significantly altered through prior mining using primarily surface mining methods which produced pits and waste rock piles. The Project Area contains mine roads, aboveground electrical utility lines and remnant mine facilities. A network of roads including extensive benches has been cut into surrounding hillsides. Most of these have not been reclaimed. There are no developed recreation areas to attract recreational viewers and none of the major historic trails are within the viewshed of the Project Area. Ranching and agriculture have introduced modifications such as fence lines, corrals, and stock tanks.

Viewer sensitivity to the visual environment in the Project Area is considered to be low. The Heap Leach Pad and On-Site Ore Processing Facility would be visible from the Crooks Gap/Wamsutter Road; however, because the processing facility and heap leach area is currently covered in white spoils material from the McIntosh Pit, there is no anticipated change to the view from Crooks Gap/Wamsutter Road. Additionally, the location of the Heap Leach Pad and On-Site Ore Processing Facility was chosen based on the advantage of overlapping existing disturbance, gentle topography, and land status (see Section 2.6.2.1), and there were no opportunities to hide or otherwise minimize the view of the processing facility from the Crooks Gap/Wamsutter Road. There are very few residences in the vicinity and no major travel corridors pass within viewing distance. The number of viewers in the vicinity is small and most viewers are there for work related to energy development or ranching; work related viewers are generally not considered to be highly sensitive to visual resource conditions. For these reasons, it was anticipated that no impacts to visual resources would occur.

Prime or Unique Farmlands. According to the Natural Resources Conservation Service (NRCS) soil survey (NRCS, 2014), there are three soil map units within the eastern part of Fremont County that are determined to be prime farmland, but only when irrigated (Biltoft, 2010). These three soil map units were not found within the Soil Analysis Area during the BKS (2014a), NRCS (2014), or 1980 historical soil surveys.

Fire and Fuels. The fire and fuels program treats an average of 10,000 acres per year, although this amount may be reduced because of budget limitations and the unlikelihood of prescribed fire treatment in greater sage-grouse Core Area. The fire and fuels program would be little impacted by any of the alternatives (Fremont County Volunteer Fire Association would respond to any fire occurring at the Project Area). Accordingly, the program will not be analyzed for impacts associated with the alternatives. Energy Fuels would employ their own fire suppression program for safety reasons throughout the Project Area. Fuels within the Project Area could consist of various vegetation including grasses, sagebrush, and various pine species. Impacts to these fuels as a result of the Project are described in the Vegetation and Special Status Species sections of this document.

Special Designations/Congressionally Designated Trails. Five Congressionally-designated trails are located in the Lander Field Office planning area; four National Historic Trails (NHTs) and one national scenic trail. These are in the general vicinity of the Project Area (the closest NHT is about 6 miles to the north and the national scenic trail is about 1.6 miles to the southwest). The Lander RMP (BLM, 2013a) established a National Trail Management Corridor (NTMC) with protections for the viewshed and setting of the NHTs. The boundaries of the NTMC were established based on a viewshed analysis of what can be seen from the NHTs. The proposed project is outside of the NTMC. The RMP also limits projects outside of the NTMC if they are “highly visible” and/or “out of scale” with the surrounding environment (Decision 7008). The BLM determined that no alternative in the EIS would meet the conditions of Decision 7008 so no further analysis of impacts to the NHTs under any alternative was deemed necessary. The BLM performed a viewshed analysis specific to this project. The majority of the project is not visible from the NHTs, and the small portion that is visible is within existing disturbance, resulting in no visual impacts to the NHTs.

Special Designations/Wild and Scenic Rivers. There are no wild and scenic rivers near the Project Area, that are either currently part of the Wild and Scenic River System or that are identified in the Lander RMP (BLM, 2013a). The closest river segments managed to maintain their wild and scenic character are reaches of the Sweetwater River over 10 miles to the north of the Project Area. Therefore, environmental impacts from any of the alternatives will not be analyzed.

Special Designations/Areas of Critical Environmental Concern (ACECs). ACECs are defined in 43 CFR § 1610.0-5 as areas 1) with relevant values (historic, cultural, scenic, wildlife or natural systems or safety issues); 2) with important values that are more than locally significant; and 3) which require special management to prevent irreparable damage. The Lander RMP (BLM, 2013a) designates ACECs including the expanded Green Mountain ACEC for elk habitat (see Map 3.3-4, below). The ACEC is not designated because of its visual resource values, although like all ACECs in the Lander management area, the Green Mountain ACEC is managed as visual resource Class II. The elk habitat that is protected by the ACEC would not be impacted by any of the alternatives. Any potential impacts to elk outside of the ACEC is analyzed in the wildlife section. Accordingly, there will be no additional analysis of ACECs in the impacts section.

Special Designations/Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics. No BLM-managed wilderness areas occur in the vicinity of the Project Area. The nearest wilderness area is on the Shoshone National Forest approximately 45 miles to the west.

No BLM Wilderness Study Areas (WSAs) are in close proximity to the Project Area. The Sweetwater Canyon WSA is 28 miles to the west and the Sweetwater Rocks complex of four WSAs is more than 13 miles to the northeast. While the Sweetwater Rocks complex is visible from the Project Area, it is too distant to be influenced by activities in the Project Area.

The Lander Field Office completed a new inventory of non-WSA lands with wilderness characteristics, (often called Lands with Wilderness Characteristics). The only Lands with Wilderness Characteristics identified in the inventory (other than existing WSAs) were in the Dubois area, more than 100 miles northwest of the Project Area.

3.2 PHYSICAL RESOURCES

3.2.1 Climate and Air Quality

3.2.1.1 Climate

The Project Area is located in a semiarid (dry and cold), mid-continental climate regime. The area is typified by dry, windy conditions with limited rainfall and long, cold winters. Meteorological measurements are collected 1) at a 10-meter meteorological station operated by Energy Fuels and located on-site in the Project Area and 2) at the National Climate Data Center Coop Site No. 484925 at Jeffrey City, located 8 miles north of the Project Area at an elevation of 6,330 feet amsl (Western Regional Climate Center - WRCC, 2013). Both sites are shown on Map 3.2-1. Meteorological data has been collected at the Sheep Mountain site since 2010 and at the Jeffrey City site since 1964.

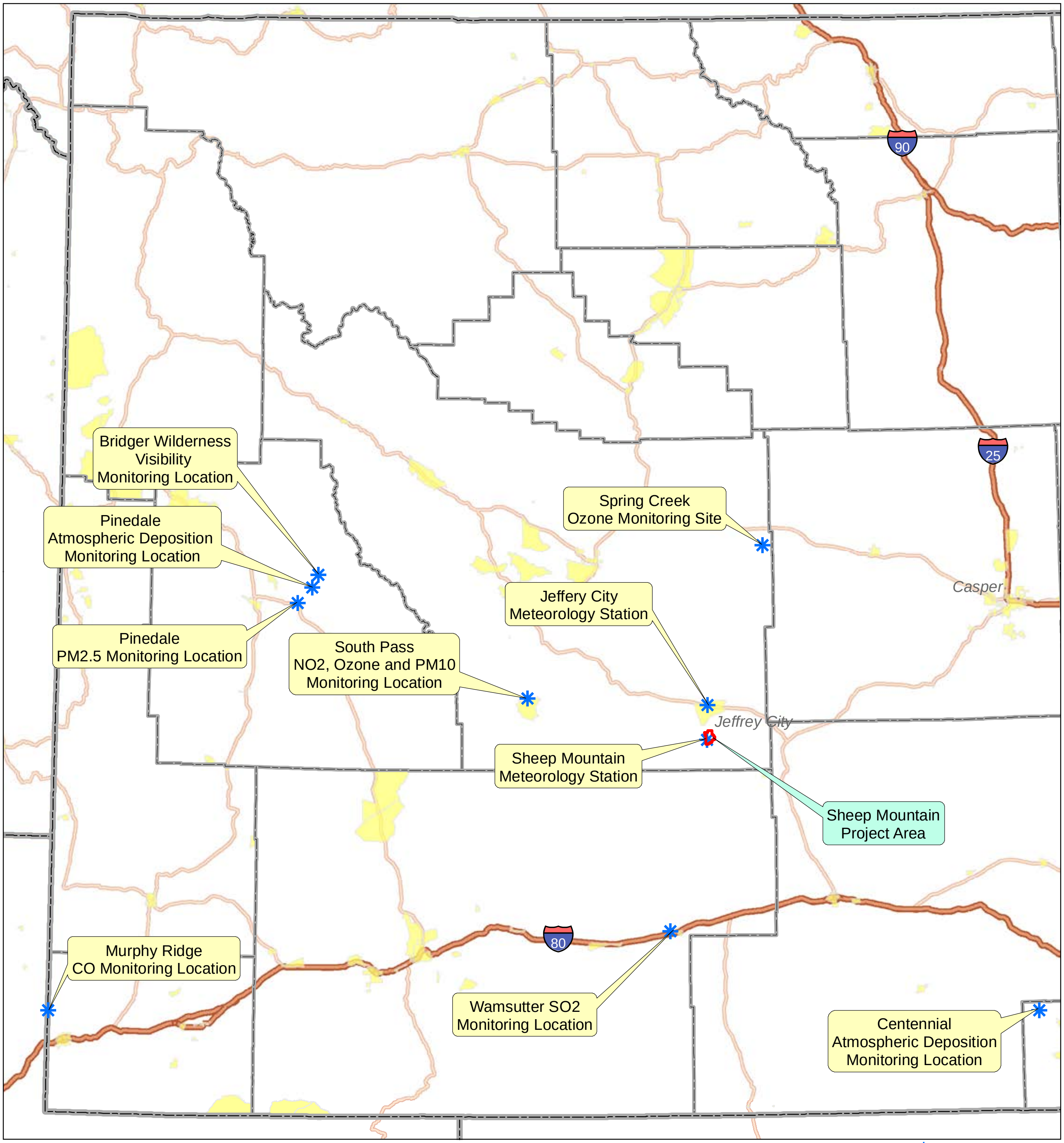
Local Climate

The annual average total precipitation at Jeffrey City is 9.80 inches, with annual totals ranging from 5.1 inches (2005) to 13.2 inches (1993). Precipitation is greatest in the spring, with consistent precipitation through summer and autumn and significantly lower precipitation totals during the winter months. An average of 56.9 inches of snow falls during the year (annual high 100.0 inches in 2009), with snowfall occurring predominantly from October through May.

The region has cool temperatures, with average temperature (in degrees Fahrenheit - ˚F) ranging between 8.7˚F and 30.7˚F in January to between 49.8˚F and 85.1˚F in July. Extreme temperatures have ranged from -39˚F (1979) to 98˚F (2002). The frost free period generally occurs from June to August. Table 3.2-1 shows the mean monthly temperature ranges and total precipitation amounts. As this table makes clear, the Project Area exhibits broad swings in climate including both temperature and precipitation. Averages are not predictive of either temperature or precipitation which can vary dramatically from year to year and from the average.

Table 3.2-1
Mean Monthly Temperature Ranges and Total Precipitation Amounts
Jeffrey City, Wyoming

Month	Average Temperature Range (˚F)	Total Precipitation (inches)
January	8.7 – 30.7	0.36
February	10.1 – 33.6	0.44
March	18.8 – 43.8	0.79
April	26.4 – 54.5	1.20
May	34.6 – 64.1	1.95
June	42.6 – 75.3	1.03
July	49.8 – 85.1	0.83
August	48.2 – 82.8	0.60
September	38.2 – 72.2	0.74
October	28.7 – 58.8	0.86
November	17.2 – 41.2	0.54
December	9.3 – 30.6	0.46
ANNUAL	41.9 (mean)	9.80 (mean)
Source: WRCC, 2013.		



Map 3.2-1
Sheep Mountain Study Area Monitoring Stations

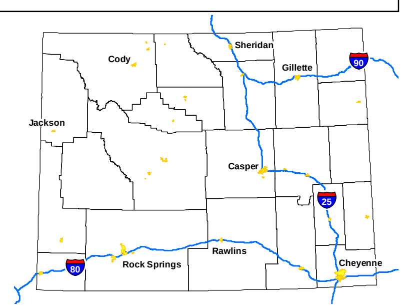
N

0 10 20 30 40 50 Miles

No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

Sheep Mountain Study Area

Monitoring Stations *(Ambient Air Quality and Meteorological Monitoring)*



While the Jeffrey City meteorological observations provide a longer-term representation of climate conditions near the Project Area, meteorological data is also collected at the Sheep Mountain site. The Sheep Mountain meteorological station was installed in August 2010. Hourly meteorological data collected at the 10-meter station includes: wind speed, wind direction, wind direction standard deviation, air temperature, delta temperature, solar radiation, relative humidity, and precipitation.

Hourly average wind speed and wind direction measurements collected at the Sheep Mountain 10-meter meteorological tower from January 2011 through December 2012 are shown in the wind rose plot, Figure 3.2-1. Approximately 56 percent of winds occurred from a south-southeasterly direction.

Table 3.2-2 provides the wind direction distribution at the Sheep Mountain site in a tabular format.

Table 3.2-2
Wind Direction Frequency Distribution,
Sheep Mountain Site, 2011 – 2012

Wind Direction	Frequency (%)
N	5.8
NNE	2.8
NE	1.9
ENE	1.8
E	1.0
ESE	1.2
SE	16.7
SSE	26.9
S	12.4
SSW	7.0
SW	5.2
WSW	4.7
W	4.1
WNW	1.6
NW	2.0
NNW	4.9

The frequency and strength of winds greatly affect the transport and dispersion of air pollutants. Table 3.2-3 shows the frequency distribution of wind speeds in the Project Area. The annual mean wind speed over the 2-year period of record is 15.2 miles per hour (mph), and that relatively high average wind speed indicates the presence of good dispersion and mixing of any potential pollutant emissions resulting from the Project Area.

Table 3.2-3
Wind Speed Distribution, Sheep Mountain Mine, 2011 – 2012

Wind Speed (mph)	Frequency (%)
0 – 4.0	4.6
4.0 – 7.5	10.7
7.5 – 12.1	22.3
12.1 – 19.0	33.2
19.0 – 24.7	16.2
Greater than 24.7	13.0

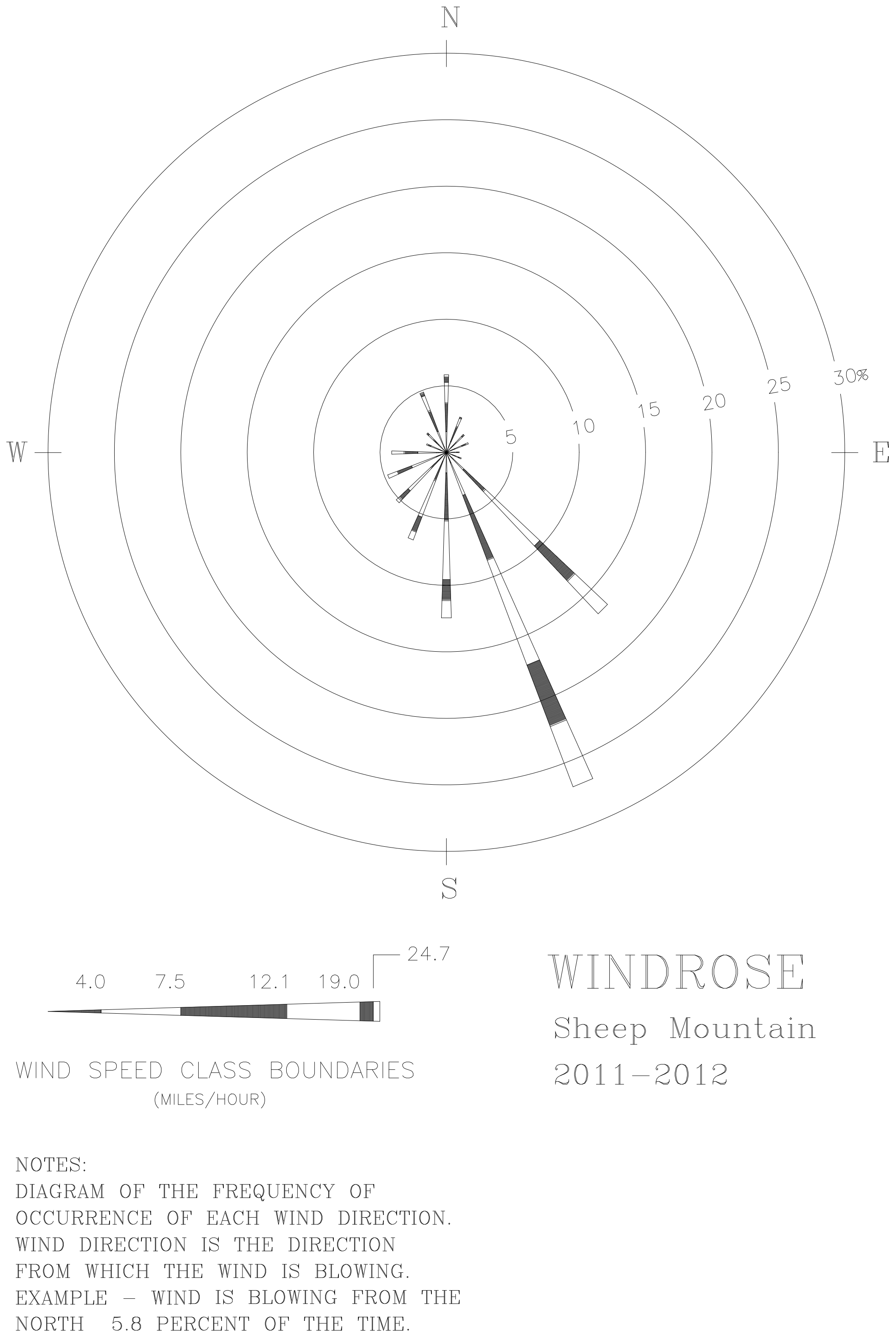


Figure 3.2-1
Sheep Mountain Meteorological Data Windrose

3.2.1.2 Air Quality

Air Pollutant Background

The Wyoming Ambient Air Quality Standards (WAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based standards which define the maximum concentration of air pollutants allowed at all locations to which the public has access. The EPA has established NAAQS for carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM less than 10 microns in effective diameter - PM_{10} and particulate matter less than 2.5 microns in effective diameter - $PM_{2.5}$), sulfur dioxide (SO_2), and lead (Pb).

All of the criteria pollutants listed above except lead are monitored at sites in the region. The monitored concentrations are used as an indicator of existing conditions in the region and establish existing compliance with ambient air quality standards. The concentrations are assumed to include emissions from industrial sources and from mobile, urban, biogenic, and other non-industrial emissions sources. The most representative monitored regional background concentrations available for criteria pollutants as identified by the WDEQ-AQD (WDEQ, 2014) are shown in Table 3.2-4. As shown in Figure 3.2-2, regional background concentrations are less than the NAAQS for all reported criteria pollutants. Monitoring for NO_2 and O_3 is also conducted at the Encana Spring Creek site, located 49 miles northeast of the Project Area. Monitoring values in 2013 for the Spring Creek site are provided in Table 3.2-5.

Table 3.2-4
Background Ambient Air Quality Concentrations

Pollutant	Averaging Period	Measured Background Concentration ($\mu g/m^3$)
CO[1]	1-hour 8-hour	904 572
NO_2[2]	1-hour Annual	9.4 1.9
O_3[2]	8-hour	131.5
PM_{10}[2]	24-hour Annual	49 11
$PM_{2.5}$[3]	24-hour Annual	27 7.0
SO_2[4]	1-hour 3-hour 24-hour Annual	18.3 18.3 3.9 0.6

[1] Data collected at Cheyenne, Wyoming during 2012, WDEQ-AQD
[2] Data collected at South Pass, Wyoming during 2012, WDEQ-AQD.
[3] Data collected in Rock Springs, Wyoming during 2012, WDEQ-AQD.

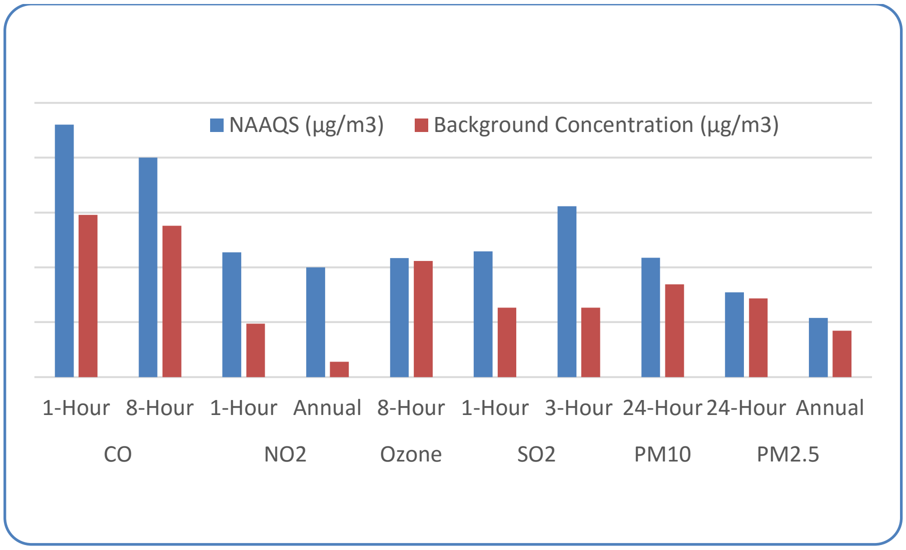


Figure 3.2-2
Regional Pollutant Concentrations Compared to NAAQS

Table 3.2-5
Spring Creek, Wyoming Monitored Air Quality Concentrations

Pollutant	Averaging Period	Measured Concentration
NO_2[1]	1-hour	7 ppm
O_3[2]	8-hour	0.066 ppm
[1] 98^{th} percentile. Source: EPA AirData.		
[2] 4^{th} high. Source: EPA AirData.		

3.2.1.3 Radiological Background

A pre-operational radiological baseline monitoring program was conducted by Energy Fuels at the Sheep Mountain site (Titan Uranium, 2011). The baseline conditions measured in this program are representative of the current radiological environment at the site. All monitoring was conducted in accordance with NRC guidance, which requires 12 consecutive months of ambient environmental radon and gamma radiation monitoring and 12 consecutive months of air particulate radionuclide monitoring (NRC, 1980).

Nine on-site air particulate monitoring stations were installed, with five stations installed in August 2010 and four in June 2011. All stations are currently on standby. Monitoring sites were selected in accordance with NRC guidance for radionuclide assessment of particulate sampling data. Passive gamma dose rate and radon measuring devices were co-located with the nine air particulate monitoring stations.

Monitoring results and reporting limits for ambient gamma dose rate monitoring are presented in Table 1 in Appendix 3-A. Results and reporting limits for passive radon monitoring are presented in Table 2 in Appendix 3-A. Tables 3 through 6 in Appendix 3-A presents monitored radionuclide concentrations based on ambient particulate monitoring data, as well as reporting limits for radionuclides.

Monitored results are generally within one order of magnitude of the reporting limits, and frequently less than five times the reporting limits, indicating relatively low radio particulate concentrations in air across the site. No clear trends of increase or decrease are evident despite the location of unreclaimed mine disturbance areas and old ore stockpiles in the monitored area with significant soil activity present (Titan Uranium, 2011).

3.2.1.4 Overview of Regulatory Environment

The WDEQ-AQD, under its EPA-approved State Implementation Plan, is the primary air quality regulatory agency responsible for determining potential impacts once detailed industrial development plans have been made, and those development plans are subject to applicable air quality laws, regulations, standards, control measures, and management practices. Therefore, the WDEQ-AQD has the ultimate responsibility for reviewing and permitting the Project prior to operation. Unlike the conceptual ‘reasonable, but conservative’ engineering designs used in NEPA analyses, the WDEQ-AQD air quality pre-construction permitting demonstrations were based on site-specific, detailed engineering values, which were assessed in the permit application review. Any facility which meets the requirements set forth under Wyoming Air Quality Standards and Regulations (WAQSR) Chapter 6 would be subject to the WDEQ-AQD permitting and compliance processes. Energy Fuels has received an air quality permit under WAQSR Chapter 6, Section 2(m) to construct the Sheep Mountain Uranium Mine (Permit Number P0015550, dated July 6, 2015).

Federal air quality regulations adopted and enforced by the WDEQ-AQD limit incremental emission increases to specific levels defined by the classification of air quality in an area. The Prevention of Significant Deterioration (PSD) program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. Incremental increases in federal Class I areas are strictly limited, while increases allowed in Class II areas are less strict. Through the PSD program, Class I areas are protected by Federal Land Managers (FLMs) by management of Air Quality Related Values (AQRVs) such as visibility, aquatic ecosystems, flora, fauna, etc.

The 1977 Clean Air Act amendments established visibility as an AQRV that FLMs must consider. The 1990 Clean Air Act amendments contain a goal of improving visibility within PSD Class I areas. The Regional Haze Rule finalized in 1999 requires the states, in coordination with federal agencies and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment.

<u>Ambient Air Quality Standards</u>

The Clean Air Act requires the EPA to set NAAQS for pollutants considered to endanger public health and the environment. The EPA has developed NAAQS for criteria pollutants: CO, NO_2, particulate matter (PM_{10} and $PM_{2.5)}$, SO_2, O_3, and Pb. Lead emissions from Project sources are negligible and therefore, the lead NAAQS is not addressed in this analysis. States typically adopt the NAAQS but may also develop state-specific ambient air quality standards for certain pollutants. The NAAQS and the WAAQS are summarized in Table 3.2-6. PSD Class I and Class II increments are also included in Table 3.2-6.

Table 3.2-6
Ambient Air Quality Standards and PSD Increments

Pollutant/Averaging Time	NAAQS	WAAQS	Units[13]	PSD Class I Increment[1] (µg/m^3)	PSD Class II Increment[1] (µg/m^3)
CO					
1-hour[2]	35	35	ppm	--[3]	--[3]
8-hour[2]	9	9	ppm	--[3]	--[3]
NO_2					
1-hour[4]	100	100	ppb	--[3]	--[3]
Annual[5]	53	53	ppb	2.5	25
Ozone					
8-hour[6]	0.070[7]	0.075[10]	ppm	--[3]	--[3]
PM_{10}					
24-hour[2]	150	150	(µg/m^3)	8	30
Annual[5]	--[8]	50	(µg/m^3)	4	17
$PM_{2.5}$					
24-hour[9]	35	35	(µg/m^3)	2	9
Annual[5]	12	12	(µg/m^3)	1	4
SO_2					
1-hour[11]	75	75	ppb	--[3]	--[3]
3-hour[2]	0.5	0.5	ppb	25	512
24-hour[2]	--[12]	--[8]	ppb	5	91
Annual[5]	--[12]	--[8]	ppb	2	20

1 The PSD demonstrations serve information purposes only and do not constitute a regulatory PSD increment consumption analysis.
2 No more than one exceedance per year.
3 No PSD increments have been established for this pollutant–averaging time.
4 An area is in compliance with the standard if the 98th percentile of daily maximum 1-hour NO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
5 Annual arithmetic mean.
6 An area is in compliance with the standard if the fourth highest daily maximum 8-hour ozone concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
7 On October 1, 2015, the EPA revised the NAAQS for 8-hour ozone concentrations from 75 ppb to 70 ppb. The effective date of the revised NAAQS is December 28, 2015 (EPA, 2015).
8 No standards are established for this pollutant-averaging time.
9 An area is in compliance with the standard if the maximum 24-hour $PM_{2.5}$ concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
10 The EPA revised the NAAQS for this pollutant (effective December 28, 2013) and the WDEQ has not yet adopted the revised NAAQS as part of their rulemaking.
11 An area is in compliance with the standard if the 99th percentile of daily maximum 1-hour SO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
12 The NAAQS for this averaging time for this pollutant has been revoked by EPA.
13 ppm=parts per million, ppb=parts per billion, µg/m^3=micrograms per cubic meter.

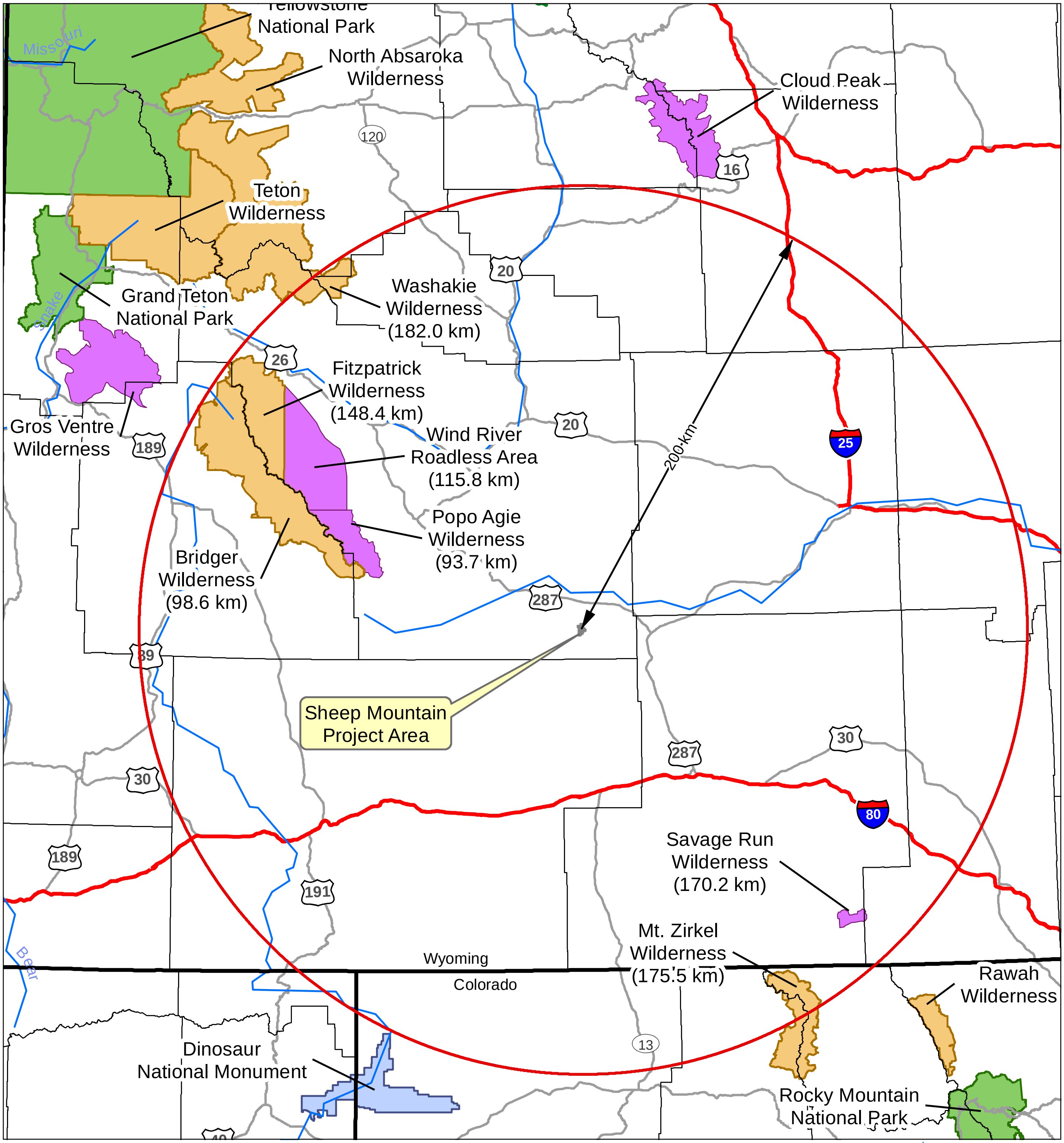
An area that is shown to exceed the NAAQS for a given pollutant may be designated as a nonattainment area for that pollutant. The Project Area is located in an area that is currently designated as attainment for all pollutants. On October 1, 2015, the EPA lowered the ozone NAAQS from 75 ppb (established in 2008) to a more stringent value of 70 ppb (EPA, 2015). The EPA expects to issue detailed guidance on the designation process in early 2016, but has indicated that attainment designations for the 2015 NAAQS will be based on 2014-2016 data. State recommendations for designations of attainment and nonattainment areas are due to EPA by October 1, 2016 and EPA will finalize designations by October 1, 2017. Therefore, at the time of writing of this document, the attainment status of the Project Area and all Wyoming counties under the 2015 ozone NAAQS is not yet known and the designations under the 2008 NAAQS remain in place.

Prevention of Significant Deterioration

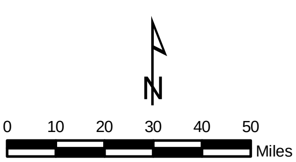
The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. All areas of the country are assigned a classification which describes the degree of degradation to the existing air quality that is allowed to occur within the area under the PSD permitting rules. Federal Class I areas are areas of special national or regional natural, scenic, recreational, or historic value, and very little degradation in air quality is allowed by strictly limiting industrial growth. Class II areas allow for reasonable industrial/economic expansion. National parks and certain wilderness areas are designated as Class I. Air quality in these areas is protected by allowing only slight incremental increases in pollutant concentrations. These incremental increases, or PSD Class I Increments, are shown in Table 3.2-6. All other areas not designated Class I are classified as Class II, where less stringent limits on increases in pollutant concentrations apply. The Project Area and surrounding areas are classified as PSD Class II.

Comparisons of project impacts to the PSD Class I and II increments are for informational purposes only and are intended to evaluate a threshold of concern. They do not represent a regulatory PSD Increment Consumption Analysis, which would be completed as necessary during the New Source Review permitting process by the WDEQ-AQD.

In addition to the PSD increments, Class I areas are protected by the FLMs through management of AQRVs such as visibility, atmospheric deposition, aquatic ecosystems, flora, fauna, etc. Evaluations of potential impacts to AQRVs are also performed during the New Source Review permitting process under the direction of the WDEQ-AQD in consultation with the FLMs. Certain Class II wilderness areas in the region have been identified by federal managers as “sensitive areas” and AQRVs have been identified as a concern. The closest federal PSD Class I area is the Bridger Wilderness Area, which is approximately 99 kilometers – km (61 miles) west-northwest of the Project Area. All federal PSD Class I areas and the sensitive Class II areas within 200 km (124 miles) of the Project Area are shown on Map 3.2-2. Impacts are also evaluated for the Wind River Roadless Area, Popo Agie Wilderness Area, Savage Run Wilderness Area (Map 3.2-2), and federal Class II areas designated as sensitive. The Savage Run Wilderness Area is afforded Class I protection by the WDEQ-AQD under WAQSR Chapter 9, Section 2(c)(iii) and is subject to PSD Class I Increments shown in Table 3.2-6. Other sensitive Class II areas are subject to PSD Class II Increments and are also shown in Table 3.2-6.

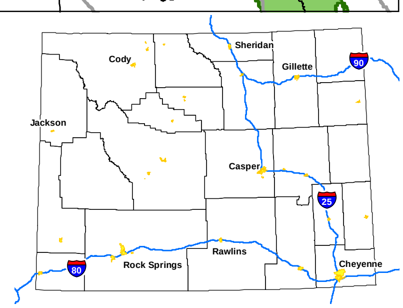


Map 3.2-2
PSD Class I Areas and Sensitive Class II Areas Within 200km of the Project Area



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

- Class I Areas: US Forest Service
- Class I Areas: National Parks
- Sensitive Class II Areas



Air Quality Related Values

An evaluation of potential impacts to AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. would be performed as part of a PSD Air Quality Analysis for a major source under the direction of the WDEQ-AQD in consultation with FLMs.

Visibility

The 1977 Clean Air Act amendments established visibility as an AQRV that FLMs must consider. The 1990 Clean Air Act amendments contain a goal of improving visibility within PSD Class I areas. The Regional Haze Rule finalized in 1999 requires the states, in coordination with federal agencies and other interested parties, to develop and implement air quality protection plans to reduce the pollution that causes visibility impairment.

Change in atmospheric light extinction relative to background conditions is used to measure regional haze. Analysis thresholds for atmospheric light extinction are set forth in Federal Land Managers' Air Quality Related Values Workgroup - FLAG (2010), with the results reported in percent change in light extinction and change in deciviews (dv). A 5 percent change in light extinction (approximately equal to a 0.5 change in dv) is the threshold recommended in FLAG (2010) and is considered to contribute to regional haze visibility impairment. A 10 percent change in light extinction (approximately equal to 1.0 dv) is considered to represent a noticeable change in visibility when compared to background conditions.

Visibility conditions can be measured as standard visual range (SVR). SVR is the farthest distance at which an observer can just see a black object viewed against the horizon sky; the larger the SVR, the cleaner the air. Visibility for the region is considered to be very good. Continuous visibility-related optical background data have been collected in the PSD Class I Bridger Wilderness, as part of the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. The average SVR at the Bridger Wilderness is over 200 km or 124 miles (Visibility Information Exchange Web System – VIEWS, 2012).

Atmospheric Deposition

Atmospheric deposition refers to the processes by which air pollutants are removed from the atmosphere and deposited on terrestrial and aquatic ecosystems, and it is reported as the mass of material deposited on an area per year in kilograms per hectare per year (kg/ha-yr). Air pollutants are deposited by wet deposition (precipitation) and dry deposition (gravitational settling of pollutants). The chemical components of wet deposition include sulfate (SO_4), nitrate (NO_3), and ammonium (NH_4); the chemical components of dry deposition include SO_4, SO_2, NO_3, NH_4, and nitric acid (HNO_3).

The National Acid Deposition Program (NADP) and the National Trends Network (NTN) station monitors wet atmospheric deposition and the Clean Air Status and Trends Network (CASTNET) stations monitor dry atmospheric deposition at sites near Centennial/Brooklyn Lake, which is approximately 163 km (101 miles) south-southeast of the Project Area and Pinedale which is 170 km (105 miles) northwest of the Project Area, shown on Map 3.2-1. The total annual background deposition (wet and dry) reported as total nitrogen (N) and total sulfur (S) deposition for year 2012 at the Centennial site is 3.26 kg/ha-yr and 1.45 kg/ha-yr, respectively and is 1.31 kg/ha-yr nitrogren and 0.54 kg/ha-yr sulfur at the Pinedale site (EPA, 2013a).

FLAG (2010) recommends that applicable sources assess the impacts of nitrogen and sulfur deposition at Class I areas. This guidance recommends establishing critical deposition loading values ("critical loads") for each specific Class I area. Critical loads are the level of atmospheric pollutant deposition below which negative ecosystem effects are not likely to occur, and are completely dependent on local atmospheric, aquatic and terrestrial conditions, and chemistry.

FLAG (2010) guidance recommends the use of deposition analysis thresholds (DATs) developed by the NPS and the FWS, which are screening level values for N and S deposition from project-only emission sources below which estimated impacts are considered negligible. The DAT established for both nitrogen and sulfur in western Class I areas is 0.005 kg/ha-yr.

In addition to the project-specific analysis, results from cumulative emission sources are compared to critical load thresholds established for the Rocky Mountain region to assess total deposition impacts. The NPS has provided recent information on nitrogen critical load values applicable for Wyoming and Colorado Class I and sensitive Class II areas (NPS, 2014). For Class I and sensitive Class II areas in Wyoming, a critical load value of 2.2 kg/ha-yr for nitrogen deposition (estimated from a wet deposition critical load value of 1.4 kg N/ha-yr) is applicable, based on research conducted by Saros et al. (2010) in the eastern Sierra Nevada and Greater Yellowstone ecosystems. This is a critical load value that is protective of high elevation surface waters. For Colorado Class I and sensitive Class II areas, a critical load value of 2.3 kg N/ha-yr is applicable, based on research conducted by Baron (2006) that estimated 1.5 kg/ha-yr as a critical loading value for wet nitrogen deposition for high-elevation lakes in Rocky Mountain National Park, Colorado.

For sulfur deposition, the critical load threshold published by Fox et al. (1989) for total sulfur of 5 kg/ha-yr, for the Bob Marshall Wilderness Area in Montana and Bridger Wilderness Area in Wyoming, is used as critical load threshold for each of the Class I and sensitive Class II areas.

3.2.1.5 Greenhouse Gases and Climate Change

Greenhouse Gases

Greenhouse gases (GHGs) in the earth's atmosphere absorb outgoing thermal radiation and re-radiate some of that heat back towards the earth causing temperatures in the lower atmosphere and on the surface of the earth to be higher than they would be without atmospheric GHGs. Higher concentrations of GHGs amplify the heat-trapping effect resulting in higher surface temperatures. Some GHGs, such as water vapor, occur naturally in the atmosphere. Others, such as carbon dioxide (CO_2) and methane (CH_4), occur naturally in the atmosphere and are also emitted into the atmosphere by human activities. The anthropogenic GHGs of primary concern are: CO_2, CH_4, nitrous oxide (N_2O), and fluorinated gases. GHGs projected to be emitted by Sheep Mountain Project sources are CO_2, CH_4, and N_2O. The atmospheric lifetimes for these gases are on the order of decades. Emitted GHGs become well-mixed throughout the atmosphere and contribute to the global atmospheric burden of GHGs. Therefore, it is not possible to attribute a particular climate impact in any given region to GHG emissions from a particular source.

In 2007, the U.S. Supreme Court ruled in Massachusetts v. EPA that the EPA has the authority to regulate GHGs such as methane and carbon dioxide as air pollutants under the Clean Air Act. The ruling did not require the EPA to create any emission control standards or ambient air quality standards for GHGs. At present, there are no ambient air quality standards for GHGs, and there are no emissions limits on GHGs that would apply to the sources developed under the Project alternatives. There are applicable reporting requirements under the EPA's Greenhouse Gas Reporting Program. These GHG emission reporting requirements, finalized in 2010 under 40 CFR § 98, require industrial sources that emit 25,000 metric tons or more of carbon dioxide equivalent (CO_2e) per year to report GHG emissions annually.

Climate Change

Climate change is a statistically-significant and long-term change in climate patterns. The terms climate change and "global warming" are often used interchangeably, although they are not the same thing. Climate change is any deviation from the average climate, whether warming or cooling, and can result from both natural and human (anthropogenic) sources. Natural contributors to climate change include fluctuations in solar radiation, volcanic eruptions, and plate tectonics. Global warming refers to the apparent warming of climate observed since the early 20th century and is primarily attributed to human activities such as fossil fuel combustion, industrial processes, and land use changes.

The natural greenhouse effect is critical to the discussion of climate change. The greenhouse effect refers to the process by which GHGs in the atmosphere absorb heat energy radiated by Earth's surface and re-radiate some of that heat back toward Earth, causing temperatures in the lower atmosphere and on the surface of Earth to be higher than they would be without atmospheric GHGs. These GHGs trap heat that would otherwise be radiated into space, causing Earth's atmosphere to warm and making temperatures suitable for life on Earth. Without the natural greenhouse effect, the average surface temperature of Earth would be about 0˚F. Higher concentrations of GHGs amplify the heat-trapping effect resulting in higher surface temperatures. Water vapor is the most abundant GHG, followed by CO_2, CH_4, N_2O, and several trace gases. Water vapor, which occurs naturally in the atmosphere, is often excluded from the discussion of GHGs and climate change because its atmospheric concentration is largely dependent upon temperature rather than being emitted by specific sources. Other GHGs, such as CO_2 and CH_4, occur naturally in the atmosphere and are also emitted into the atmosphere by human activities.

Atmospheric concentrations of naturally-emitted GHGs have varied for millennia and Earth's climate has fluctuated accordingly. However, since the beginning of the industrial revolution around 1750, human activities have significantly increased GHG concentrations and introduced man-made compounds that act as GHGs in the atmosphere. The atmospheric concentrations of CO_2, CH_4, and N_2O have increased to levels unprecedented in at least the last 800,000 years. From pre-industrial times until today, the global average concentrations of CO_2, CH_4, and N_2O in the atmosphere have increased by around 40 percent, 150 percent, and 20 percent, respectively (IPCC - Intergovernmental Panel on Climate Change, 2013).

Human activities emit billions of tons of CO_2 every year. Carbon dioxide is primarily emitted from fossil fuel combustion, but has a variety of other industrial sources. Methane is emitted from oil and natural gas systems, landfills, mining, agricultural activities, and waste and other industrial processes and the gradual thawing of permafrost naturally emits frozen methane. Nitrous oxide is emitted from anthropogenic activities in the agricultural, energy-related, waste, and industrial sectors. The manufacture of refrigerants and semiconductors, electrical transmission, and metal production emit a variety of trace GHGs including hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. These trace gases have no natural sources and come entirely from human activities.

The current understanding of the climate system comes from the cumulative results of observations, experimental research, theoretical studies, and model simulations. The IPCC Fifth Assessment Report (AR5) (IPCC, 2013) uses terms to indicate the assessed likelihood of an outcome ranging from exceptionally unlikely (0–1 percent probability) to virtually certain (99–100 percent probability) and level of confidence ranging from very low to very high. The findings presented in AR5 indicate that warming of the climate system is unequivocal and many of the observed changes are unprecedented over decades to millennia. It is certain that Global Mean Surface Temperature has increased since the late 19th century and virtually certain (99–100 percent probability) that maximum and minimum temperatures over land have increased on a global scale since 1950. The globally averaged combined land and ocean surface temperature data show a warming of 1.5°F. Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea-level rise, and in changes in some climate extremes. It is extremely likely

(95 to 100 percent probability) that human influence has been the dominant cause of the observed warming since the mid-20th century (IPCC, 2013). Findings from AR5 and reported by other organizations (National Aeronautics and Space Administration - NASA Goddard Institute for Space Studies, 2013; National Oceanic and Atmospheric Administration - NOAA National Climate Data Center, 2013) also indicate that changes in the climate system are not uniform and regional differences are apparent (BLM, 2014c).

National Assessment of Climate Change

The U.S. Global Change Research Program released the third U.S. National Climate Assessment (NCA) in May 2014. The Assessment summarizes the current state of knowledge on climate change and its impacts throughout the United States. It was written by climate scientists and draws from a large body of peer-reviewed scientific research, technical reports, and other publicly available sources. The Assessment documents climate change impacts that are currently occurring and those that are anticipated to occur throughout this century. It also provides region-specific impact assessments for key sectors such as energy, water, and human health.

The Assessment summarizes their conclusions in a number of Key Messages (NCA, 2014a), several of which are excerpted here:

- Global climate is changing and this change is apparent across a wide range of observations. The global warming of the past 50 years is primarily due to human activities.
- Global climate is projected to continue to change over this century and beyond. The magnitude of climate change beyond the next few decades depends primarily on the amount of heat-trapping gases emitted globally, and how sensitive the Earth’s climate is to those emissions.
- U.S. average temperature has increased by 1.3°F to 1.9°F since record keeping began in 1895; most of this increase has occurred since about 1970. The most recent decade was the nation’s warmest on record. Temperatures in the United States are expected to continue to rise. Because human-induced warming is superimposed on a naturally varying climate, the temperature rise has not been, and will not be, uniform or smooth across the country or over time.
- Average U.S. precipitation has increased since 1900, but some areas have had increases greater than the national average, and some areas have had decreases. More winter and spring precipitation is projected for the northern United States, and less for the Southwest, over this century.
- Global sea level has risen by about 8 inches since reliable record keeping began in 1880. It is projected to rise another 1 to 4 feet by 2100.
- The oceans are currently absorbing about a quarter of the carbon dioxide emitted to the atmosphere annually and are becoming more acidic as a result, leading to concerns about intensifying impacts on marine ecosystems.

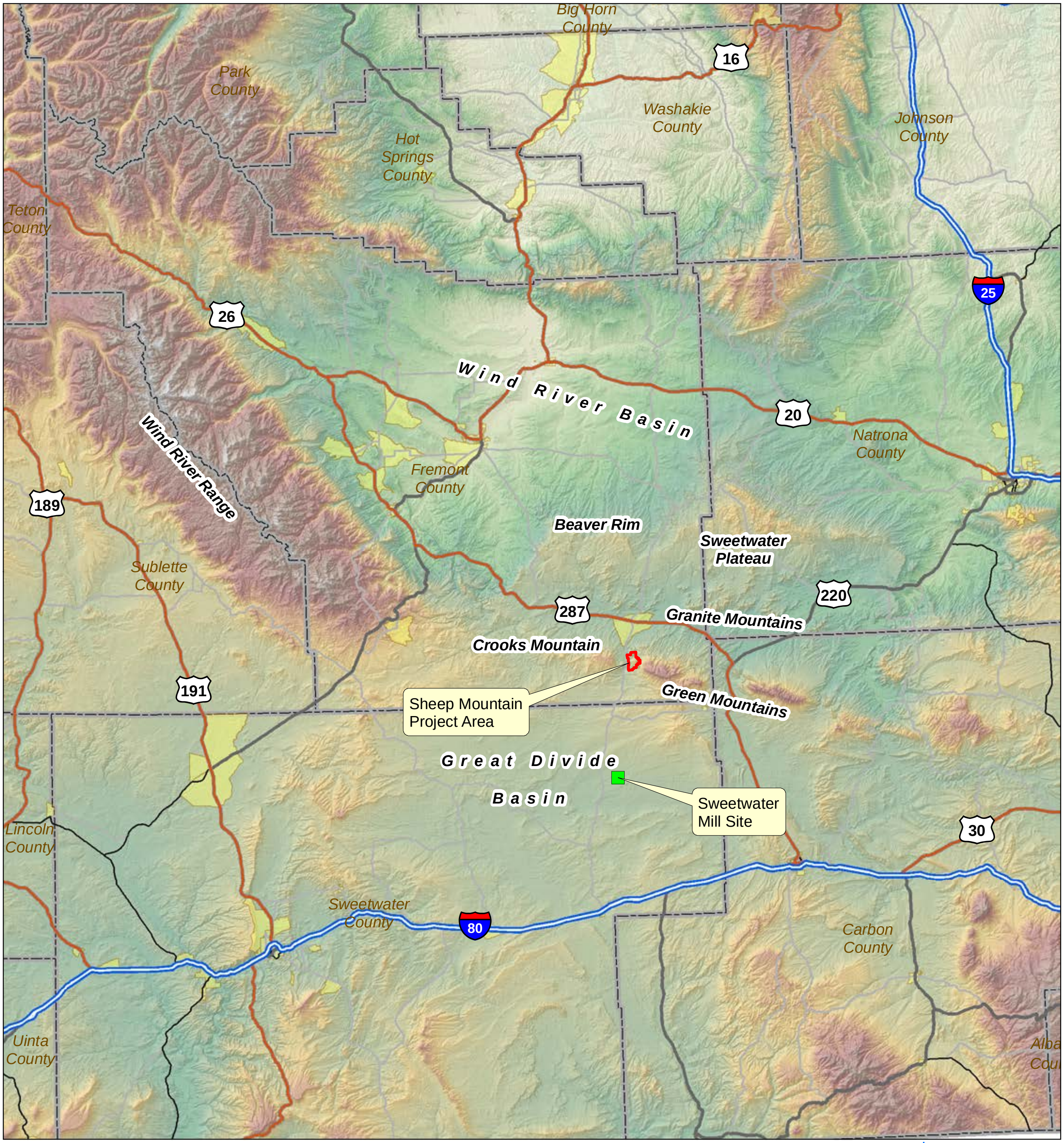
The Assessment provided analysis of projected climate change by region, and the Sheep Mountain Uranium Project is part of the Great Plains Region. The Key Messages for this region (NCA, 2014b) are as follows:

- Rising temperatures are leading to increased demand for water and energy. In parts of the region, this will constrain development, stress natural resources, and increase competition for water among communities, agriculture, energy production, and ecological needs.
- Changes to crop growth cycles due to warming winters and alterations in the timing and magnitude of rainfall events have already been observed; as these trends continue, they will require new agriculture and livestock management practices.
- Landscape fragmentation is increasing, for example, in the context of energy development activities in the northern Great Plains. A highly fragmented landscape will hinder adaptation of species when climate change alters habitat composition and timing of plant development cycles.
- Communities that are already the most vulnerable to weather and climate extremes will be stressed even further by more frequent extreme events occurring within an already highly variable climate system.
- The magnitude of expected changes will exceed those experienced in the last century. Existing adaptation and planning efforts are inadequate to respond to these projected impacts.

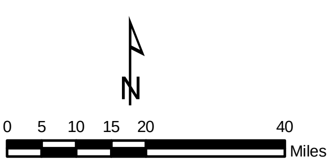
3.2.2 Geologic Resources

3.2.2.1 Physiography and Topography

Physiography and topography throughout Wyoming is highly variable and represents a broad geologic setting. Wyoming’s landscape is generally influenced by localized mountain systems that are part of the much larger Rocky Mountains (see Map 3.2-3). The mountains of Wyoming vary in style, size, and geology, but are often separated by basins. Basins in Wyoming are also variable in size and geology, but can be characterized by rolling plains, dissected drainages, and featureless terrain. The largest and most extensive mountain range in Wyoming is the Wind River Mountains in the south-central part of the state. The Wind River Basin occupies the area to the east of the Wind River Mountains, and the Great Divide Basin lies to the south (part of the Greater Green River Basin). The Sweetwater River runs from the southern portion of the Wind River Mountains to the south and east along the Sweetwater Plateau and through the Granite Mountains. The Granite Mountains and Sweetwater Plateau denote a broad elevated highland between the Great Divide Basin and the Wind River Basin. Steep escarpments along the Beaver Rim separate the Wind River Basin and the Sweetwater Plateau. Crooks Mountain, Green Mountain, and the Ferris Mountains create an east west trending mountain system that designates the boundary between the Great Divide Basin and the Granite Mountains; however, these mountains are not considered to occupy the Sweetwater Plateau (Love, 1970).



Map 3.2-3
General Features in the Project Area



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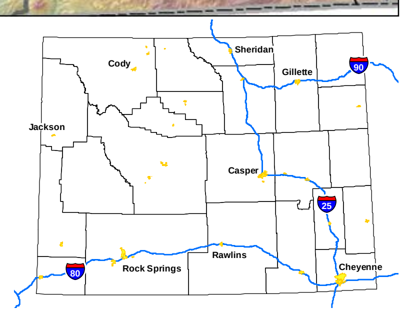
Legend

Project Area Boundary
Sweetwater Mill Site



The Project Area is located in the south-central part of Wyoming in an area known as Crooks Gap, and is part of the 40,000 square mile Wyoming Basin physiographic province which is typified by high elevation cold plains and mountains (Fenneman, 1928). The Project Area is located on Sheep Mountain which is part of the east-west trending mountain system that also includes Green Mountain to the east and Crooks Mountain to the west. Sheep Mountain is located at the southern margin of the Granite Mountains and the northern margin of the Great Divide Basin. The terrain in the area consists of rounded hills, incised drainages, ridges, bluffs, and some isolated mountainous areas. Elevations in the Project Area range from about 6,600 in the northwest corner to 7,835 feet at the top of Sheep Mountain. The topography within the Project Area is dominated by steep escarpments and mountainous terrain that has been influenced by historic mining activities.

Historically constructed drill pad access roads dissect the steep slopes throughout the Project Area (see Photo 3.2-1). The McIntosh Pit is representative of historic conventional mining efforts with vertical high walls on nearly every side and deep blue water created by groundwater rebound after mining of the pit ceased. Other mine workings on Sheep Mountain that have undergone some degree of reclamation include: the Seismic Open Pit, Reserve Shaft, Ravine and Congo inclines, Paydirt Open Pit, Sheep I and II shafts, Golden Goose I Shaft, and Heald Open Pit.

Photo 3.2-1
Historically Constructed Drill Pad Access Roads in the Project Area

3.2.2.2 Geology

Geology of the Sheep Mountain region is shown on Map 3.2-4 and Figures 3.2-3 and 3.2-4 and can be understood by describing the basins, stratigraphy, structural features, depositional history, and uranium deposition (Jones et al., 2011). The Granite Mountains were largely influential in the deposition of uranium-bearing strata within the Wind River and Great Divide basins and will be discussed throughout this analysis. Because the majority of Tertiary stratigraphy represents deposition from the Granite Mountains into both basins, the two basins contain similar sedimentology despite separate formational nomenclature.

Basins. The Project Area is situated on the structural boundary of the Great Divide Basin and Wind River Basin referred to as the Granite Mountains and Sweetwater Plateau. The Wind River Basin is an asymmetric synclinal structural and sedimentological basin that covers 8,500 square miles and contains nearly 20,000 feet of sediment (Keefer, 1965). The Great Divide Basin lies to the south of the Project Area and is an internally-drained closed basin composed of approximately 7,500 feet of Tertiary sedimentary rocks underlain by up to 13,000 feet of Mesozoic and Paleozoic sediments (Blackstone, 1991).

Stratigraphy. Rocks in the Sheep Mountain region range from Precambrian-age to Quaternary-age and are shown on Map 3.2-4.

Three ages and types define the Precambrian rocks in the Granite Mountains. The oldest rocks are chiefly composed of metasedimentary schist, slate, phyllite, quartzite, and diorite (Love, 1970). A similar metasedimentary rock cut by pegmatite dikes and containing spudomene is found on Black Mountain and the southern part of the Rattlesnake Hills. The majority of the Precambrian rocks that make up the Granite Mountains are composed of coarse-grained granite. The fractured granite is often cut by mafic dikes as evidenced in a discontinuous eastward trending belt along the north part of Sheep Mountain (Stephens, 1964).

Regional Quaternary-age rocks consist of alluvium within the Crooks Creek floodplain and alluvial fan deposits from Crooks Mountain and Sheep Mountain erosion. Quaternary sand dunes can be found in the basins to the north and south of the Project Area (Pipiringos, 1955). Thicknesses of individual formations vary considerably from place to place because of at least two angular unconformities within the Tertiary sequence (Stephens, 1964).

Tertiary stratigraphy includes the Miocence-age Moonstone and Split Rock formations, the Oligocene-age White River Formation, Eocene-age Ice Point Conglomerate, Wagon Bed, Wind River and Indian Meadows formations, lower Eocene-age Battle Spring Formation, and the Paleocene-age Fort Union Formation. The Tertiary rocks in the area are important in understanding the history of the Granite Mountains and the depositional history of both the Great Divide and Wind River basins.

The Moonstone Formation is the youngest of the Tertiary-age rocks within this report, and consists of uranium and thorium rich tuffaceous sandstone and lacustrine shales found only in the central Granite Mountains area (Love, 1970). The Split Rock Formation creates the gently south sloping Sweetwater Plateau and outcrops along the Beaver Rim. Four subdivisions complete the lithology of the Split Rock Formation: the lower porous sandstone sequence, the clayey sandstone sequence, the silty sandstone sequence, and the upper porous sandstone sequence. All of the subdivisions contain tuffaceous sediments. The upper porous sandstone sequence contains the Sweetwater moss agates popular with rock collecting enthusiasts.

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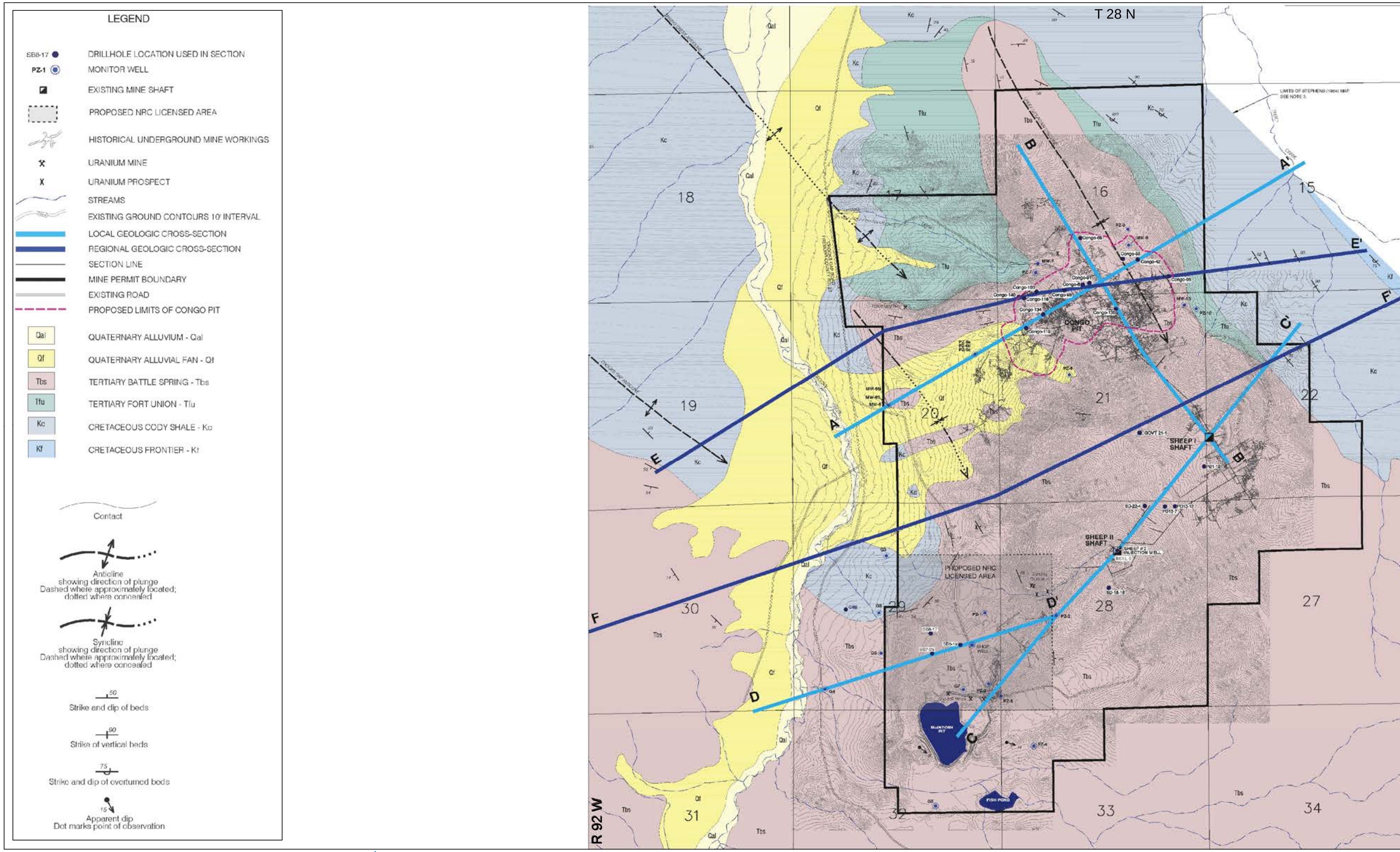

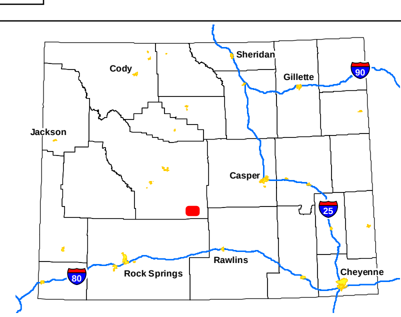

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Map 3.2-4
Regional Geology

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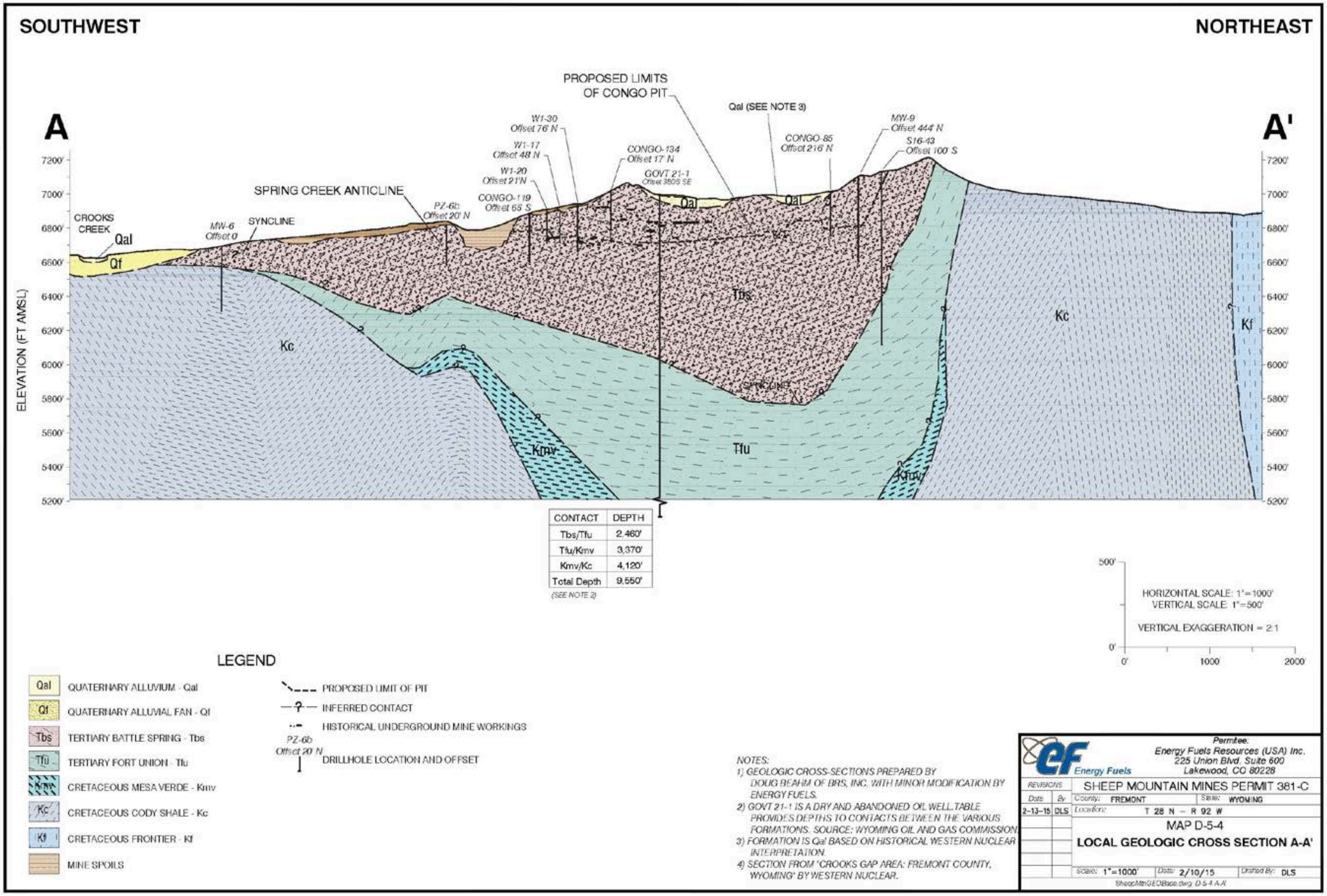


Figure 3.2-3
Local Geological Cross-Section A-A

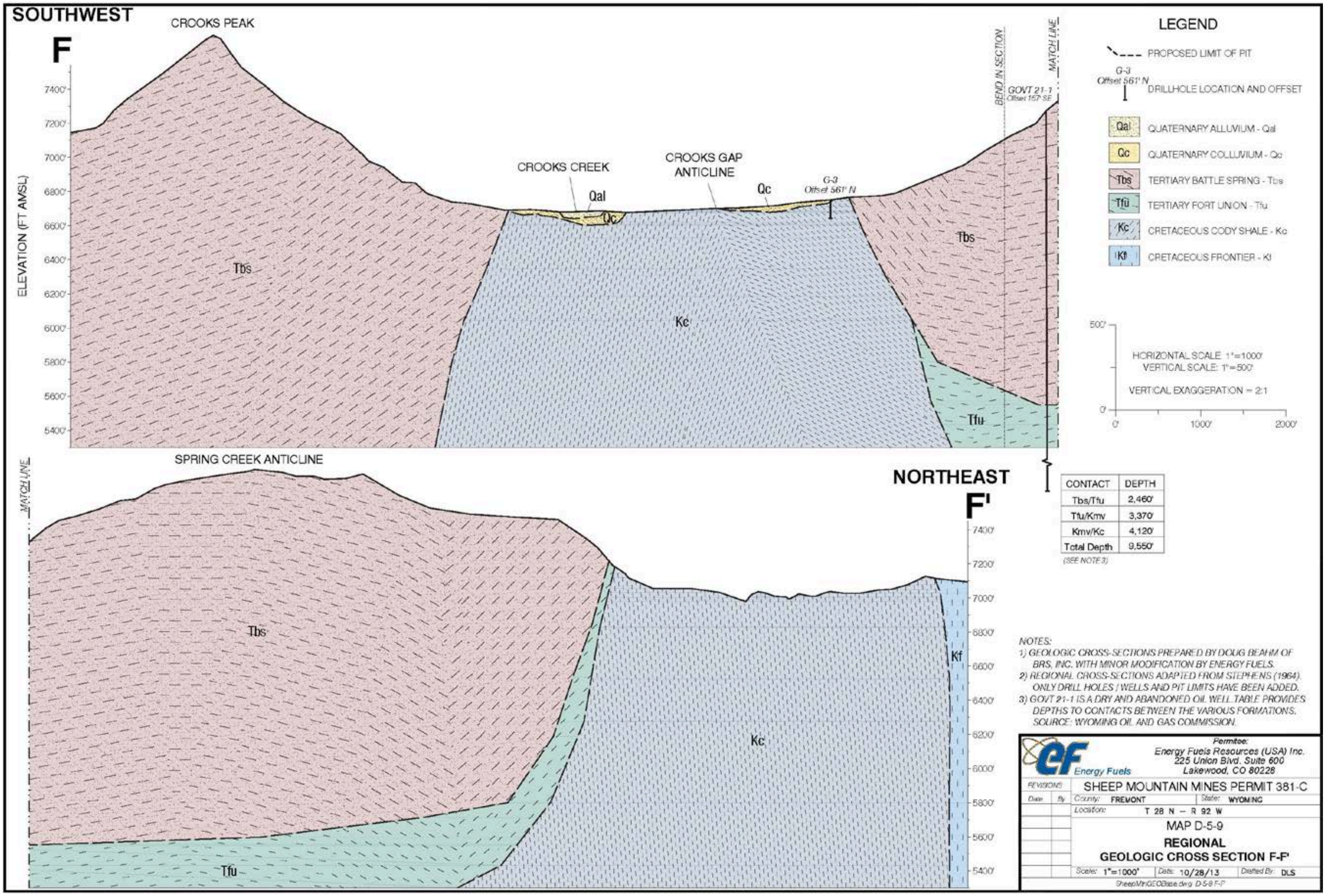


Figure 3.2-4
Local Geological Cross-Section F-F

Underlying the Split Rock Formation is the White River Formation of Oligocene age which is widely known as the cap of the Beaver Rim. The White River is composed of homogeneous massive white to grayish-orange sandy siltstone. Pumicite deposits (ash-fall) and large flakes of biotite, hornblende and magnetite distinguish the White River from the Split Rock. Volcanic rock fragments and tuff are found in cliffs of the White River Formation south of the Big Sand Draw oil and gas field (Love, 1970).

Several localized Eocene formations have been identified in the Sheep Mountain vicinity including the Ice Point Conglomerate and Wagon Bed Formation. The Ice Point Conglomerate is only found at the southern portion of the Granite Mountains and is principally composed of angular boulders and pebbles of Precambrian rocks, Flathead sandstone, Mesozoic sandstones, and Paleozoic limestones (Love, 1970). The Wagon Bed Formation is distinguished by large amounts of locally derived tuff sourced from the Rattlesnake hills and is generally considered part of the Wind River Formation (Van Houten, 1964).

Two additional formations that are not present near Sheep Mountain but are valuable in understanding the overall geologic setting are the Wind River and Indian Meadows formations. These formations are only visible north of the Beaver Rim within the Wind River Basin. The varying lithology of the Wind River Formation represents the depositional vicinity to numerous source rocks and varies between boulder conglomerates and fine-grained sandstones (Love, 1970). Precambrian and Paleozoic boulders are found within the Wind River Formation near the Granite Mountains while fine-grained sandstones are found near Lysite at the northern margin of the Wind River Basin. The Indian Meadows Formation consists of up to 6,000 feet of conglomeratic sandstone and lenses of carbonaceous siltstone, claystone, and shale found in outcrops in the northern part of the basin (Van Houten, 1964).

The Crooks Gap Conglomerate was named by Love (1970) and refers to the large granite boulders embedded in pink to gray arkosic sandstone and siltstone found almost exclusively on Crooks Mountain and Green Mountain. This Eocene-age conglomerate unconformably overlies the Battle Spring and Wasatch formations and was interpreted by Love as occurring on the north side of Sheep Mountain.

The Eocene-age Battle Spring Formation is the principal ore-bearing rock within the Project Area and is the stratigraphic equivalent to the Wind River Formation north of the Granite Mountains. Generally, the Battle Spring Formation is characterized as a high energy fluvial deposit with discontinuous interbeds of conglomerate, arkosic sandstone, siltstone, and mudstone (Pipiringos, 1955). Thickness within the Great Divide Basin ranges from 1,000 to 4,500 feet (Welder and McGreevy, 1966). The Battle Spring is split into an upper (B) member and lower (A) member. The upper member contains conglomeratic and arkosic sandstone with granitic detritus and becomes finer grained to the south. The lower member contains increasingly large amounts of sedimentary detritus and coarsening northward conglomerates (Stephens, 1964). Uranium mineralization in the form of uraninite is typically found within the A member and is described in Section 3.2.3.1, below. Because of varying topography and structure, the Battle Spring Formation ranges from 0 to 2,000 feet thick within the Project Area (800 feet in the Congo Pit and 2,000 feet under Sheep Mountain).

The Battle Spring Formation intertongues with all of the subdivisions of the Wasatch Formation (Pipiringos, 1955). The two are often grouped together, but the Battle Spring is considered a mountain-ward fluviatile facies of the main body of the Wasatch Formation (Mason and Miller, 2005).

The Wasatch Formation is split into many different subdivisions including the Red Desert, Niland, New Fork, Cathedral Bluff, and Desertion Point Tongues and is commonly characterized by red-colored fluviatile rocks of early Eocene age (Sullivan, 1980). The Wasatch Formation is conformably underlain by the Fort Union throughout most of the Great Divide Basin, and the two are often indiscernible in vertical section, except on the basin margins where the Wasatch Formation is incompletely represented (Sullivan, 1980).

The Paleocene-age Fort Union Formation unconformably underlies the Battle Spring Formation in the Crooks Gap area, except where absent (Stephens, 1964). The Fort Union Formation consists of lenticular white to brown sandstone, conglomerate, shale, and siltstone and can be up to 800 feet thick (Keefer, 1965).

Late Cretaceous-age sedimentary rocks within the Great Divide and Wind River basins include: the Lance Formation, Lewis Shale, Mesaverde Formation, and Cody Shale (Love, 1970). In the Granite Mountains area, the Lance Formation, Lewis Shale, and Mesaverde Formation were eroded away prior to deposition of Tertiary-age rocks leaving the Cody Shale behind. The Cretaceous Cody Shale consists of dark gray, limy, marine shale that is sandy in the upper half with some thin sandstone and bentonite beds (Love, 1970). The Cody Shale creates a low permeable layer that impedes groundwater flow and is part of the Baxter-Mowry confining unit as described by Mason and Miller (2005).

Structural Features Structural features in the Sheep Mountain area include a series of northwest trending asymmetric anticlines composed of Paleozoic and Mesozoic rocks, faults associated with the uplift and subsidence of the Granite Mountains, an east trending zone of normal faults, and several thrust sheets at the northern edge of Crooks Mountain and Green Mountain (see Map 3.2-4).

Folds. Four northwest trending asymmetric anticlines composed of Paleozoic and Mesozoic rocks create an angular unconformity between the Tertiary rocks in the Sheep Mountain area. The southwest limb of each structure tends to be cut by a high angle reverse fault and has a much steeper angle than the opposing limb.

The Sheep Creek anticline is the furthest east of these structures and is about 1-mile wide and 3-miles long. The southwest flank dips as steeply as 75 degrees overturned and the northeast flank dips up to 41 degrees. The Spring Creek Anticline exposes the Cody Shale just north of Sheep Mountain and extends southeastward under the mountain. The Crooks Gap Anticline plunges beneath Eocene-age rocks just north of Crooks Peak. South Happy Spring Anticline is the furthest west of the four features and is similar in orientation and dimensions, but the anticline plunges beneath Crooks Mountain (Stephens, 1964).

The North Happy Springs anticline is to the north and west of the four asymmetric faults and appears to trend east-west, parallel to the Kirk Normal Fault. A reverse fault on the north side of the anticline repeats the Mesozoic rocks that later became displaced through normal faulting (Stephens, 1964).

Faults. The South Granite Mountain fault system is counterpart to the North Granite Mountain fault system that together bound the Granite Mountains and Sweetwater Plateau. Movement along this fault occurred during the early Eocene when the Granite Mountains were uplifted. Upward vertical displacement associated with this initial faulting was as much as 3,000 feet (Love, 1970). Later, during middle Eocene time, the Granite Mountains subsided into the Split Rock Syncline and the South Granite Mountain fault system and recorded at least 2,000 feet of downward vertical displacement (Love, 1970).

The Kirk normal fault is a branch of the South Granite Mountain fault system. This fault is recognized as an irregularly curved, eastward extending normal fault that creates an abrupt break in topography where Crooks Peak yields to the low-angle Sweetwater River Valley. Surficial evidence indicates that the south side of this fault is down-dropped. North of Crooks Mountain, the Battle Spring Formation contacts nearly vertical sandstone beds of the Split Rock

Formation and displacement was estimated at 2,250 feet (Love, 1970). Faulting along the Kirk normal fault was considered to occur during the middle-Miocene through the Pliocene (Stephens, 1964).

Just to the north of Sheep Mountain along the Crooks Creek drainage, the Kirk normal fault splits and the southern branch, named the East Kirk normal fault, continues to the southeast (Map 3.2-4). The amount of displacement along this fault is unknown because of the lack of exposure, but the break between Green Mountain and the Sweetwater River Valley juxtaposes the Mesozoic and Paleozoic rocks of the Sheep Creek anticline with Precambrian granite.

The Emigrant Trail thrust fault is a low angle subsurface fault that is approximately 50 miles long and runs from the Beaver Rim southeast to Crooks Gap where it intersects the Kirk normal fault. Displacement associated with this fault can be as much as 15,000 in the Granite Mountains.

The Sheep Mountain area is dissected by shallow normal faults within Member A of the Battle Spring Formation as visible within walls from historic mine workings; however, movement is thought to have occurred during the Eocene with a maximum offset of 50 feet (Stephens, 1964).

Thrust Sheets. Two major thrust sheets that are bounded by thrust faults have been identified by Stephens (1964) in the northern part of T. 28 N., R. 92 W. (Map 3.2-4). The larger of the two thrust sheets, the Granite Mountains thrust sheet, represents a displaced structural block from the main mass of the Granite Mountains to the northeast and is bounded to the southwest by the Emigrant Trail thrust. One test hole drilled to the northwest of the visible thrust sheet penetrated 1,230 feet of Tertiary rocks and 1,800 feet of granite before hitting overturned Paleozoic and Mesozoic rocks (Stephens, 1964).

Another, separate thrust sheet was identified by Stephens (1964) to the north of Crooks Mountain called the Happy Springs thrust sheet and can only be shown in wells where the Frontier Formation repeats. Presumably, the Granite Mountains thrust sheet overrode the Paleozoic and Mesozoic rocks that make up the Happy Springs thrust sheet during southward movement along the Emigrant Trail thrust fault.

Geologic History. Geology within the Crooks Gap and Granite Mountains area was largely influenced by the Late Cretaceous and Early Eocene Laramide Orogeny (Love, 1970). In order to understand the geology and uranium deposition within Crooks Gap, the geologic history of the Granite Mountains must be understood. Deposition and uplift of the Granite Mountains occurred in sequences beginning in the Late Cretaceous.

Uplift of the Granite Mountains began during the Late Cretaceous while the Wind River Basin to the north and the Great Divide Basin to the south sank in a nearly parallel orientation. This event eroded the Lewis Shale and Mesaverde Formation from the Granite Mountains area and deposited the Lance Formation in the surrounding basins (Love, 1970).

During Paleocene time, the magnitude of uplift in the Granite Mountains increased while the subsidence of the flanking basins decreased. Erosion stripped the Lance Formation from the banks of the Granite Mountains into the Great Divide and Wind River basins. Erosion and deposition kept the sinking basins approximately at sea level where lakes and coal swamps developed the Fort Union Formation (Love, 1970).

The next phase of the Granite Mountains uplift (early Eocene) was the most severe, and a high concentration of folding and faulting ensued. Compressional forces in the southwest direction developed major low-angle thrusts and reverse faults. Anticlines and small thrusts formed on the north and south flanks of the Granite Mountains and created the southwest trending Sheep Creek, Spring Creek, Crooks Gap, and South Happy Springs Anticline (Love, 1970).

Increased uplift created northeast flowing and southwest flowing drainage systems. The northeast drainage flowed into the Wind River Basin, and through a series of violent uplifts deposited large arkosic fans in the vicinity of the Granite Mountains that make up the lower part of the Wind River Formation. The southwest drainage flowed into the Great Divide Basin in a similar fashion, and the Battle Spring and Wasatch formations were deposited as large coarse-grained arkosic fans on the margins of the coal-swamps that occupied the basin at the time. The majority of uranium deposits found within the Great Divide Basin are found in these arkosic fans. Violent uplifting and faulting persisted during the early Eocene, and Precambrian rocks overrode Mesozoic and Paleozoic rocks creating the two major thrust sheets in the Crooks Gap area (Love, 1970).

For a few million years following rapid upheaval, the Granite Mountains were relatively stable and regional subsidence in Wyoming allowed deposition of the Green River Formation where oil shale and tar sand deposits can be found today (Pipiringos, 1955).

Between early and middle Eocene, the Granite Mountains rose up to 5,000 additional feet along the east-west trending North and South Granite Mountain fault systems. This uplift deposited the giant boulders found within the Crooks Gap Conglomerate. Boulders within the upper part of the Wind River Formation deposited during this time comprise the uranium host rock in the Gas Hills (Soister, 1968).

For the next 20 million years that make up the late Eocene, the Granite Mountains were relatively stable, and the Wind River Basin filled with sediment. Volcanic activity in the Rattlesnake Hills added to the deposition of the surrounding basins as evidenced within the Wagon Bed Formation. Drainage through the Wind River Basin was blocked to the north and east, and several fresh-water lakes occupied the region. A local uplift in the southern portion of the Wind River Mountains led to the deposition of conglomeratic fans within the Great Divide Basin that make up the Ice Point Conglomerate (Love, 1970).

Large amounts of volcanic debris sourced from the Absaroka volcanic area was deposited by a powerful river into the Great Divide Basin and western Granite Mountains. This river is thought to have begun in the late Eocene and continued throughout the Oligocene. The White River Formation is the depositional result of this prehistoric river. The Oligocene was a markedly drier climate than the late Eocene and sediments within the White River Formation reflect this change (Love, 1970).

Rapid deposition and basin fill during the late Eocene and Oligocene led to subsidence of the Granite Mountains during the Miocene which accelerated burial rates. The Miocene marks the deposition of tuffaceous sandstone beds within the Split Rock Formation and Moonstone Formation. The tuffaceous sandstone deposits contain high concentrations of thorium and uranium that are thought to have been sourced from the Yellowstone National Park region (Love, 1970). During the Late Pliocene or Early Pleistocene, the Granite Mountain fault block subsided with the reactivation of the North and South Granite Mountain fault complexes. Synchronously, the Great Divide and Wind River basins became elevated with epeirogenic uplift. This allowed the establishment of the North Platte and Sweetwater River drainages while forcing the Wind River to re-excavate the Wind River Basin and flow to the north (Van Houten, 1964).

Further subsidence of the western portion of the Granite Mountains from Pleistocene to recent tilted the strata of the Sweetwater Plateau slightly southward. This tilt halted the flow of northward flowing streams such as Crooks Creek and Sheep Creek and allowed groundwater containing dissolved uranium to flow southwards and accumulate along fault boundaries or other such barriers. The Green Mountain and Crooks Mountain lineament was most likely formed during this time either as a process of headward erosion or superimposition by Crooks Creek (Love, 1970).

Uranium Mineralogy and Occurrence. The Project Area overlaps the Crooks Gap/Green Mountain Mining district which is a highly productive mining district with the majority of the most productive mines occurring within the Project Area. It is estimated that 20 million pounds of U_3O_8 or yellowcake has been mined from within the Sheep Mountain Project Area. The uranium host rock within the Project Area consists of coarse-grained medium to light gray arkosic sandstones within the A Member of the Battle Spring Formation, and ore is found to principally mineralize as uraninite and coffinite. Some deposits of schroeckingerite are also known to contain uranium with a major accessory mineral of pyrite (Love, 1970). Uranophane, autonite, and uraninite often visibly characterize ore deposits, but ore can also show no visible uranium minerals. Additional mineralization has been found within carbonaceous sediments of the lower part of the A member. Sediments in the Battle Spring Formation contain from 0.0005 to 0.001 percent uranium (Mason and Miller, 2005). Ore grade and thickness vary depending on the mineralization, environment, and lithology. Typically ore thickness varies from 50 to 200 feet along strike, 5 to 8 feet in height, and 20 to 100 feet in width (Roscoe Postle Associates, Inc. - RPA, 2006).

Uranium deposition in the Granite Mountains area is found in several different environments. Typically, uranium within the Wind River Formation north of the Granite Mountains is found in roll-front or redox-front deposition, while uranium in the A member of the Battle Spring Formation accumulates in a wide variety of environments including: channelized roll-front deposition, deep-trend deposition, and ravine deposition (RPA, 2006). Groundwater plays an important role in uranium accumulation within the Granite Mountains area (Stephens, 1964), but the source material for uranium mineralization is somewhat controversial.

Love (1970) and Stephens (1964) agree that uranium precipitates from groundwater in a reducing environment within arkosic and carbonaceous rocks as evidenced by the roll-front style pattern that characterizes the ore-zones in the Gas Hills and Crooks Gap areas. The origin of the uranium deposits in the Granite Mountains area, including Crooks Gap and the Gas Hills, has been attributed to three different hypotheses. One potential source for uranium involves leaching into the porous Wind River and Battle Spring formations from the overlying uraniferous tuffaceous volcanic rocks of the Moonstone and Split Rock formations. Another hypothesis suggests that granitic sediments within the Battle Spring and Wind River formations leached uranium deposits internally. This hypothesis is supported by the relatively high concentrations of uranium within the source granite of the Granite Mountains. Stephens (1964) suggested that uranium within the Crooks Gap area is the result of hydrothermal alteration from a deep primary source of uranium-bearing water as supported by the accumulation of uranium near faults. Love (1970) believed that uranium bearing groundwater would precipitate near faults because they act as a structural barrier where accumulation is made possible. In general, the high concentrations of uranium within the Granite Mountains area could be a product of a combination of different depositional environments.

3.2.2.3 Geological Hazards

Overburden Characteristics. Energy Fuels conducted sampling and analysis of overburden (waste rock) material at the Congo Pit area to identify the potential for this material to become hazardous during storage or upon reclamation (WDEQ, 2015a). Overburden material at the Congo Pit area is composed of Quaternary aged Alluvium and weathered material from the uranium host rock Battle Spring Formation. Analysis of overburden by Energy Fuels was aimed at identifying the presence of potential hazards such as high radiological or metal concentrations and acid formation and comparing these concentrations to the WDEQ-LQD suitability guidelines for overburden and topsoil (WDEQ, 1994). Particular hazards of concern that were further evaluated consist of: radium-226, radon-222, sodium adsorption ratios (SARs), boron, acid base potential, selenium, and molybdenum.

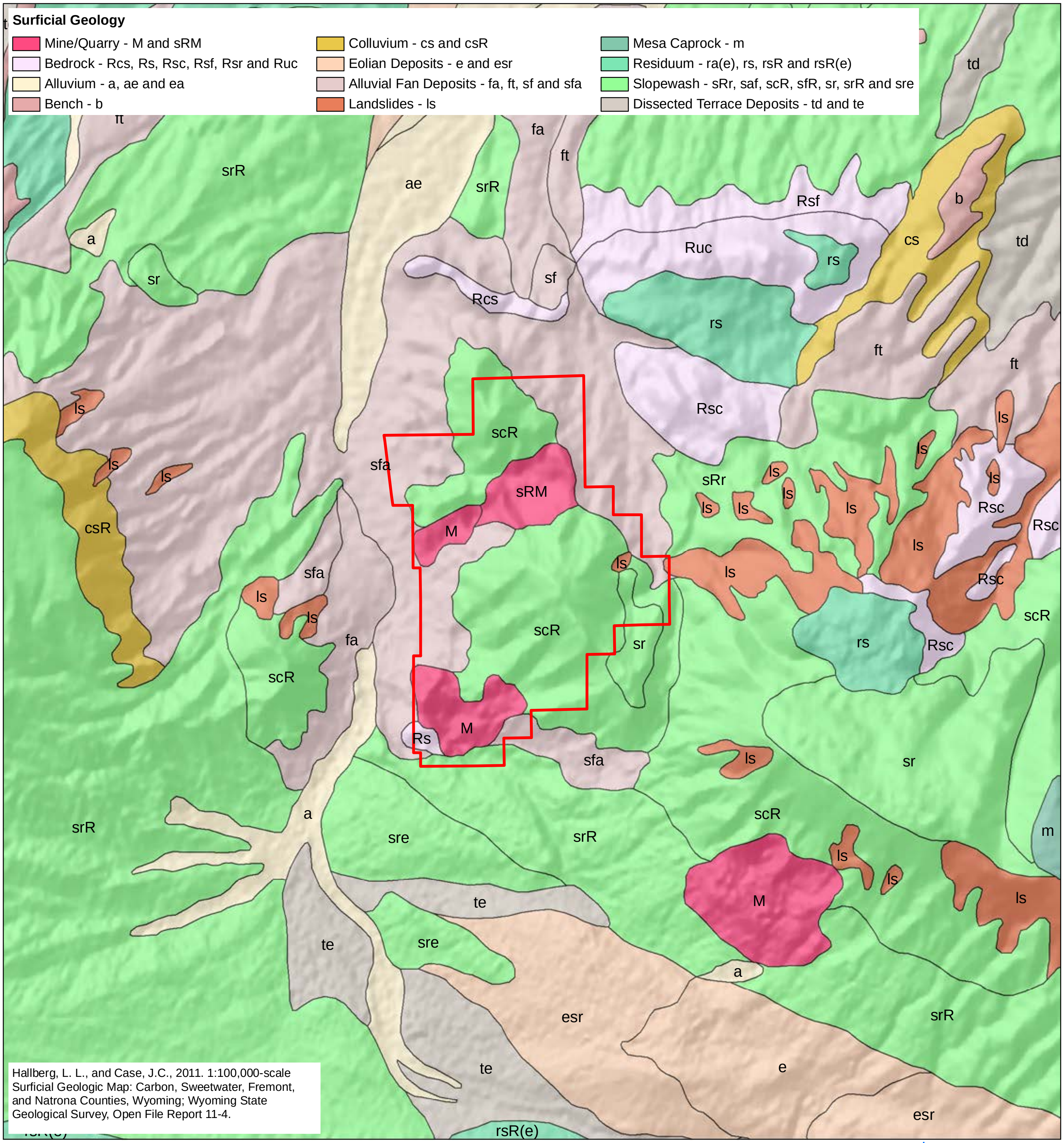
Energy Fuels found during their analysis that ore zones are typically high in radiological and metal concentrations while non-ore zones nearer the surface have much lower concentrations. This is similarly the case for selenium and magnesium concentrations. Selenium concentrations as high as 1.53 ppm were identified in drillholes within ore zones at the Congo Pit, and concentrations in non-ore zones did not exceed 0.3 ppm. Molybdenum levels were as high as 27.3 ppm within ore zones. Boron concentrations exceeding 5 ppm were identified in overburden in one drillhole at the Congo Pit. Low pH levels (<5.5) and marginal SARs (>10) are identified within ore zones. Acid base potentials between -0.12 and -7.59 (calcium carbonate - $CaCO_3$ equivalent/1,000 tons) were mostly identified within ore zones and contained an average pH of 5.4 (WDEQ, 2015a).

Seismology. Engineering Analytics (2013) performed a seismic hazard analysis that included a historic review of earthquakes within a 200 mile radius of the Project Area as of July, 2011. The analysis evaluated ground motion related to faults, background earthquake events, and a summary of short-term and long-term ground motions from specified probabilities of exceedance. According to the analysis, nine potentially active faults were identified near the Project Area, and the Green Mountain segment of the South Granite Mountain Fault system produced the largest peak ground acceleration (PGA) at 0.94g, where g is equal to the acceleration due to gravity or 9.8 meters per square second (m/s^2). Based on probabilistic analyses, the mean PGAs for the 2,500-year and 10,000-year return periods were estimated to be 0.16g and 0.58g, respectively, for the analysis area. Maps prepared by the USGS place the Project Area at 0.21g with a 10 percent probability of exceedance in 50 years (USGS, 2008). The Uniform Building Code (UBC, 1997) Seismic Zone Map shows the Project Area in Seismic Zone 1 based on a conservative PGA of 0.1g.

The overall potential for seismic activity in the regional vicinity of the Project Area is low (Case, 1997). The largest recorded earthquake within the analysis area (179 miles away) occurred November 8, 1882 west of Fort Collins, Colorado as a magnitude 6.6; however, more than 80 percent of the earthquakes within the analysis area had magnitudes less than 5.0 (Engineering Analytics, 2013). The Green Mountain segment of the South Granite Mountain Fault system has the highest potential for earthquakes in the immediate vicinity of the Project Area and could generate a 6.75 magnitude earthquake recurring every 2,000 to 6,000 years (USGS, 2010a). As of December 2010, the closest historic event, located approximately 9 miles east of the site, occurred on December 11, 1996, and had a magnitude of 3.4 (Engineering Analytics, 2013; USGS, 2010a).

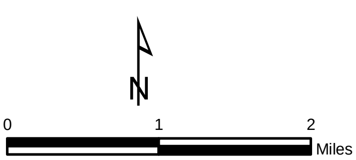
Landslides. One relatively small landslide has been mapped on steep slopes of Sheep Mountain towards Sheep Creek (Map 3.2-5) (Hallberg and Case, 2011). This landslide is classified as a multiple debris/earth flow or slide. Landslides are known to occur on the northern flanks of Green Mountain as debris flows/slides and Crooks Mountain to the east as Quaternary alluvial fans. These slides usually consist of arkosic debris and Mesozoic rock fragments in an argillaceous matrix. Within the vicinity, landslides generally occur on steep slopes at the contact between arkose of the Battle Spring Formation and the Cody Shale.

Karsts. The majority of the Project Area overlies what is classified by the USGS as fissures, tubes, and caves over 1,000 feet long, 50 to 250 feet vertical extent; in moderately steeply dipping beds of carbonate rock. This classification is based off of seismic data and gravity anomaly interpretations and possibly reflects the underground workings associated with historic mining efforts at Sheep Mountain (USGS, 2001). No caves subject to protection under the Federal Caves Protection Act of 1988 have been identified.



Map 3.2-5
Surficial Geology

Sheep Mountain Project Area



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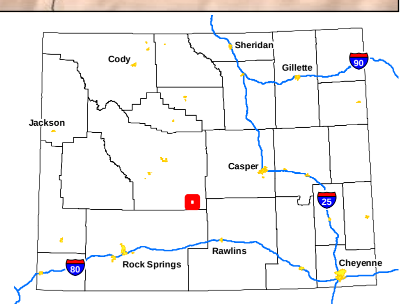


3.2.3 Mineral Resources

Although uranium is the primary mineral resource underlying the Project Area, other mineral resources occur in the region including: oil, gas, coal, bentonite, jade, sand, gravel, and other minerals (Hausel et al., 1979). Bentonite and uranium are managed as locatable minerals subject to the 43 CFR § 3809 regulations. Oil and gas (including coal bed methane) are managed in accordance with the Mineral Leasing Act of 1920 as amended. Mineral materials such as sand and gravel are subject to the Materials Act of 1947. No geothermal resources in the Project Area have been identified as commercially viable for leasing subject to the Geothermal Programmatic Record of Decision of 2008 or solid mineral leasables.

3.2.3.1 Locatable Minerals

Uranium deposits are known to occur in four major districts in Wyoming with the dominant source material coming from Precambrian granites of the Granite Mountains (Love, 1970). The Great Divide and Wind River basins both contain significant uranium deposits sourced from the Granite Mountains and found within the Wasatch and Battle Spring formations (Stephens, 1964). Uranium projects in the Gas Hills and Lost Creek permitted to utilize ISR to mine uranium. Energy Fuels estimates the mineral resource at Sheep Mountain to be in excess of 30 million pounds of uranium with an average grade of 0.111 percent U_3O_8 or yellowcake.

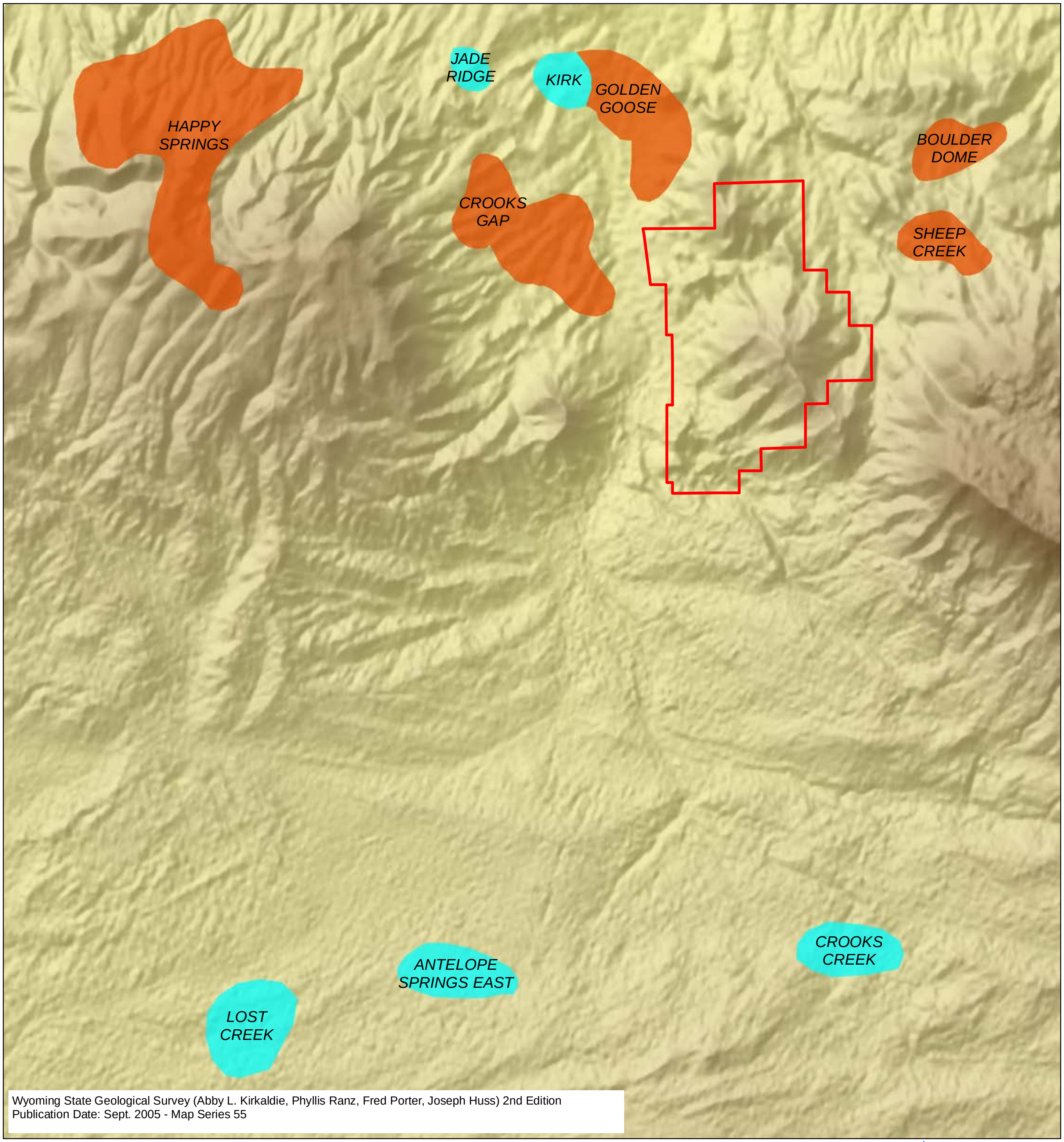
Nephrite jade is a specialty stone found in the Granite Mountains area within boulders and veins of Precambrian rocks. Green and black shades of jade have been collected in Wyoming since the 1930’s, and the largest tonnage has come from the Crooks Gap area from boulders in the Wasatch and Battle Spring formations (some greater than 3,000 pounds) (Hausel et al., 1979; Love, 1970). The most valuable jade is apple green in color and was mineralized from hydrothermal waters during the Granite Mountains uplift and subsequent faulting (Love, 1970). No investigations have been conducted concerning the economic viability of jade within or adjacent to the Project Area.

Outcrops of the bentonite bearing Cretaceous Shales occur at the northern edge of the Project Area and cover approximately 1 square mile (Knechtel and Patterson, 1956). Bentonite is a locatable mineral and is generally mined throughout Wyoming from outcrops of the Cretaceous Cloverly, Thermopolis, Mowry, Frontier, and Cody shales. The primary mineral constituent of bentonite in Wyoming is the clay montmorillonite but often contains clinoptilolite, phillipsite, mica, gypsum, and other less valuable minerals. No investigations have been conducted concerning the economic viability of the bentonite-bearing formations near the Project Area.

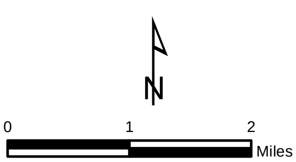
Gypsum, zeolite, pumicite, and vermiculite are commonly viable minerals that occur in outcrops near the Project Area but have never been mined and are not considered to be economic in this area. Thorium and vanadium are economically valuable constituents often found accessory to uranium, but do not occur in valuable quantities within the Project Area (Love, 1970).

3.2.3.2 Leasable Minerals

Leasable minerals in the region of the Project Area include oil, gas, and coal. Producing oil and gas fields/units in the immediate vicinity of the Project Area include: Happy Springs, Crooks Gap, Sheep Creek, Crooks Creek, Golden Goose, Boulder Dome, Jade Ridge, Antelope Springs East, Lost Creek, and Kirk (gas storage agreement site) (Map 3.2-6). Production history of these fields is listed in Table 3.2-7. These fields typically produce from structural traps related to the anticlinal complex formed by early Eocene uplift along the Emigrant Trail Thrust where Fort Union and younger strata unconformably overlap the Cody Shale or older rocks (Love, 1970).



Map 3.2-6
Oil and Gas Fields in the Vicinity of the Project Area



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Sheep Mountain Project Area
Gas Field
Oil Field

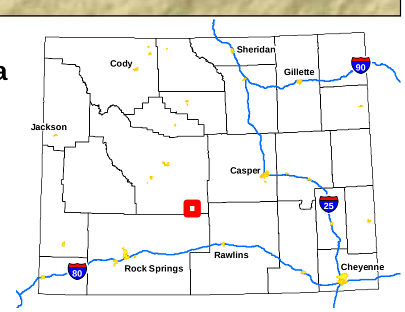


Table 3.2-7
Oil and Gas Field Production History

Field	Location	Discovery Year	Total Wells	Producing Wells	Idle Wells	2012 Oil BBLS	2012 Gas MCF	Total Cumulative Oil BBLS	Total Cumulative Gas MCF
Happy Springs	T28N R93W	1950	30	27	3	9,530	27,034	9,175,610	11,071,958
Crooks Gap	T28N R92, 93W	1944	15	14	1	9,420	0	13,497,576	1,362,402
Sheep Creek	T29N R92W	1935	7	6	1	3,254	0	347,137	0
Crooks Creek	27N 92W	1991	2	0	2	0	0	0	135,148
Golden Goose	28N 92W	1966	9	6	1	1,900	0	984,272	156,153
Boulder Dome	28N 92W	1984	2	0	0	0	0	11,074	0
Kirk	28N 92W	1954	13	0	0	0	0	935,988 (injected)	0
Jade Ridge	28N 93W	1976	4	0	0	0	0	30,537	965,311
Antelope Springs East	27N 93W	1959	1	0	0	0	0	0	191,081
Lost Creek	27N 93W	1976	3	0	0	0	0	0	32,958

Source: WOGCC, 2013.

Only one oil and gas well has been drilled within the Project Area (NESE Section 21 T28N, R92W); it was determined to be dry and subsequently abandoned and capped in 1959 (Wyoming Oil and Gas Conservation Commission - WOGCC, 2013). The Found Soldier Unit is not a proven field but overlaps the southern and eastern boundary of the Project Area in Sections 27 and 33, T28N, R92W.

Coal bed methane potential in the vicinity of the Project Area is moderate to the south, within the Green River Coal Field, and low to very low within the Project Area (Hausel et al., 1979).

Coal reserves have been identified in beds of the Wasatch Formation throughout the Great Divide Basin and represent the Green River Coal Region. Coal in the northern part of the Great Divide Basin has been largely uninvestigated, but Love (1970) conservatively estimated the amount of un-described coal in this region to be greater than 1 billion tons. There have been no activities associated with coal leasing in the Lander Field Office planning area within the last 70 years and the NOI for the RMP revision (BLM, 2007) did not contain a “coal-call” which would generate interest in coal leasing.

3.2.3.3 Mineral Material Disposals

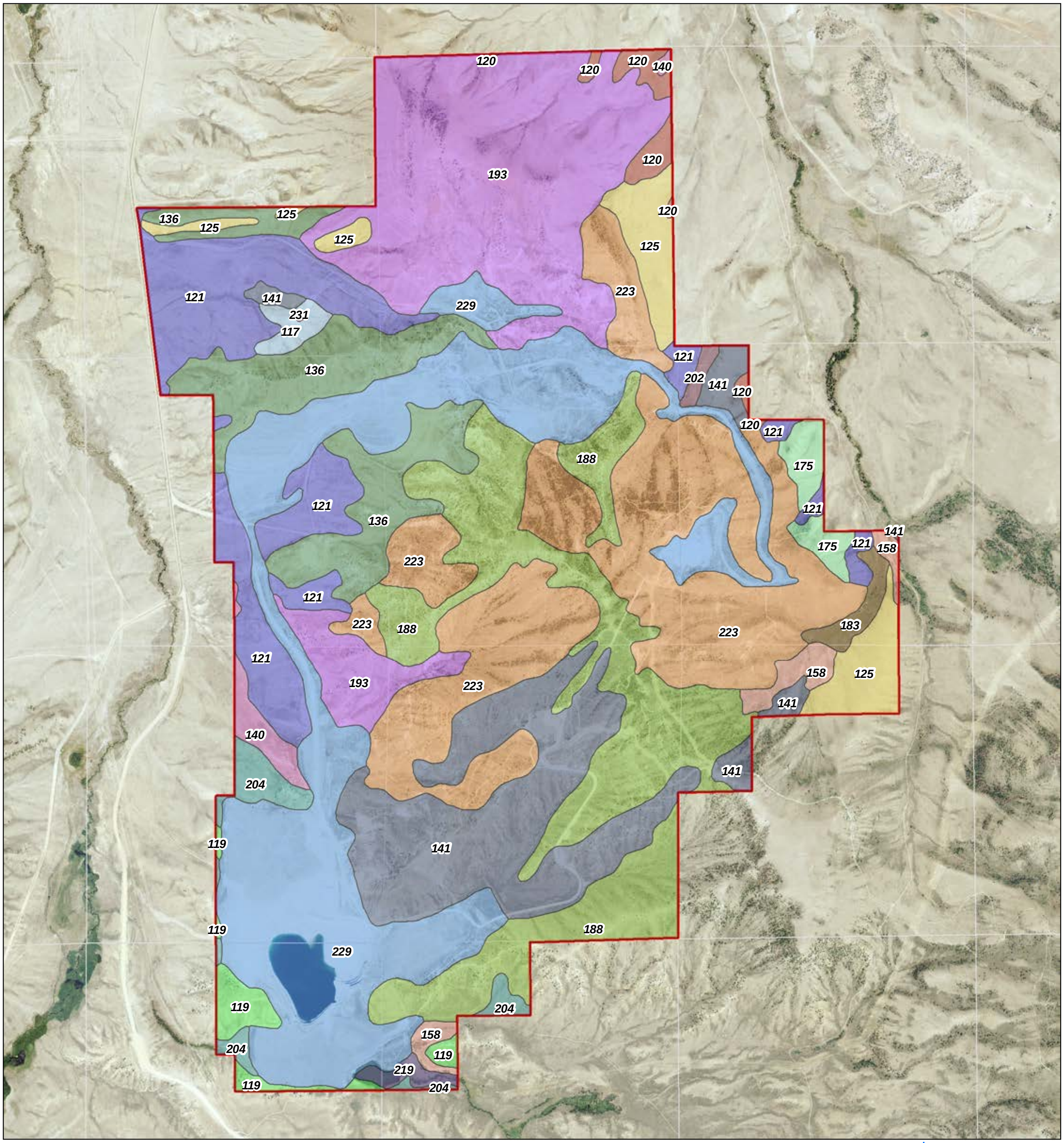
There are currently no active mineral material or salable mineral permits within the Project Area. Sand is plentiful throughout the Sheep Mountain area and Great Divide Basin. The Battle Spring Formation contains abundant arkosic sandstone and can be up to 2,000 feet thick within the Project Area. Active sand dunes to the north and south of the Project Area have been identified but have never been mined (Stephens, 1964). Granite, quartzitic sandstone, chert, and limestone rock fragments make up the gravel deposits found within lenses of all Tertiary rocks in the area including the Battle Spring and Fort Union formations. There are known Limestone deposits to the northeast of the Project Area within exposed Paleozoic and Mesozoic rocks. Additionally, a private gravel sale site is located to the southwest near Happy Springs (SW Section 21 T27 N R93W, 6th P.M., WY, WYW167944), and it is anticipated that 50,000 cubic yards of material is to be removed from the pit. Fremont County has one active Free Use Permit at Jeffrey City (SW Section 3 T29N R92W, 6th P.M., WY, WYW154885) and is currently authorized to remove 130,000 cubic yards of material.

3.2.4 Soils

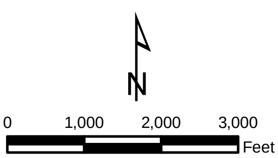
3.2.4.1 Introduction

In 1983, soils within Fremont County, including the Project Area, were surveyed to an Order 3 scale by the United States Department of Agriculture (USDA), NRCS (2014). The NRCS information is summarized on Map 3.2-7, and the soil map units are described in Section 3.2.4.2. In 1979, to support the Western Nuclear mine permit documents for WDEQ-LQD Permit to Mine 381C, Mine Reclamation Consultants, Inc. completed a soil survey in the Permit Area. The information from this survey is included as Exhibit D-7.1 of Appendix D-7 of the updated Permit to Mine 381C (WDEQ, 2015a). In 2010 and 2013, BKS performed additional soil surveys in the Permit Area, including sampling and mapping of soils and existing topsoil stockpiles (BKS, 2011a and BKS, 2014a). The BKS soil surveys, including topsoil salvage information, are discussed in more detail in Section 3.2.4.3 below and in Appendix D-7 of the Permit to Mine 381C (WDEQ, 2015a). The soil information is summarized on Map 3.2-8. In 2010 and 2011, field investigations were also conducted within the Sheep Mountain Project Area to determine baseline gamma levels and corresponding radium-226 levels. The radiological information is discussed in more detail in Section 3.2.4.4

Generally, the soils in the Project Area are typical of semi-deserts in the western intermountains of the United States and consist of coarse-loamy textures. Rounded hills with moderate to steep slopes make up the topography of the region with elevations ranging between 6,600 feet and 8,000 feet. Sage and grasses sparsely occupy the lower elevations and pine trees inhabit the higher elevations. Due to prevailing climate and vegetation conditions, organic matter is accumulated slowly and is confined primarily to the surface horizon resulting in a light-coloration throughout the profile (BKS, 2011a). Soil depths vary throughout the area, and depth to paralithic material can be from 5 to 60 inches. Most soils within the area were formed in slope alluvium over residuum weathered from sandstone. The susceptibility of the soils within the area to erode through wind and water varies from negligible to moderate based on organic matter content and texture. In general, the Project Area shows relatively high radiological background due to outcropping mineralized zones within the Battle Spring Formation historical mining and exploration activities in the Project Area and vicinity.



Map 3.2-7
NRCS Soils within the Project Area



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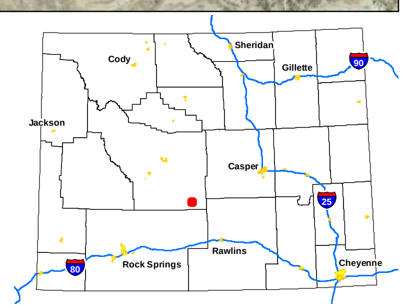
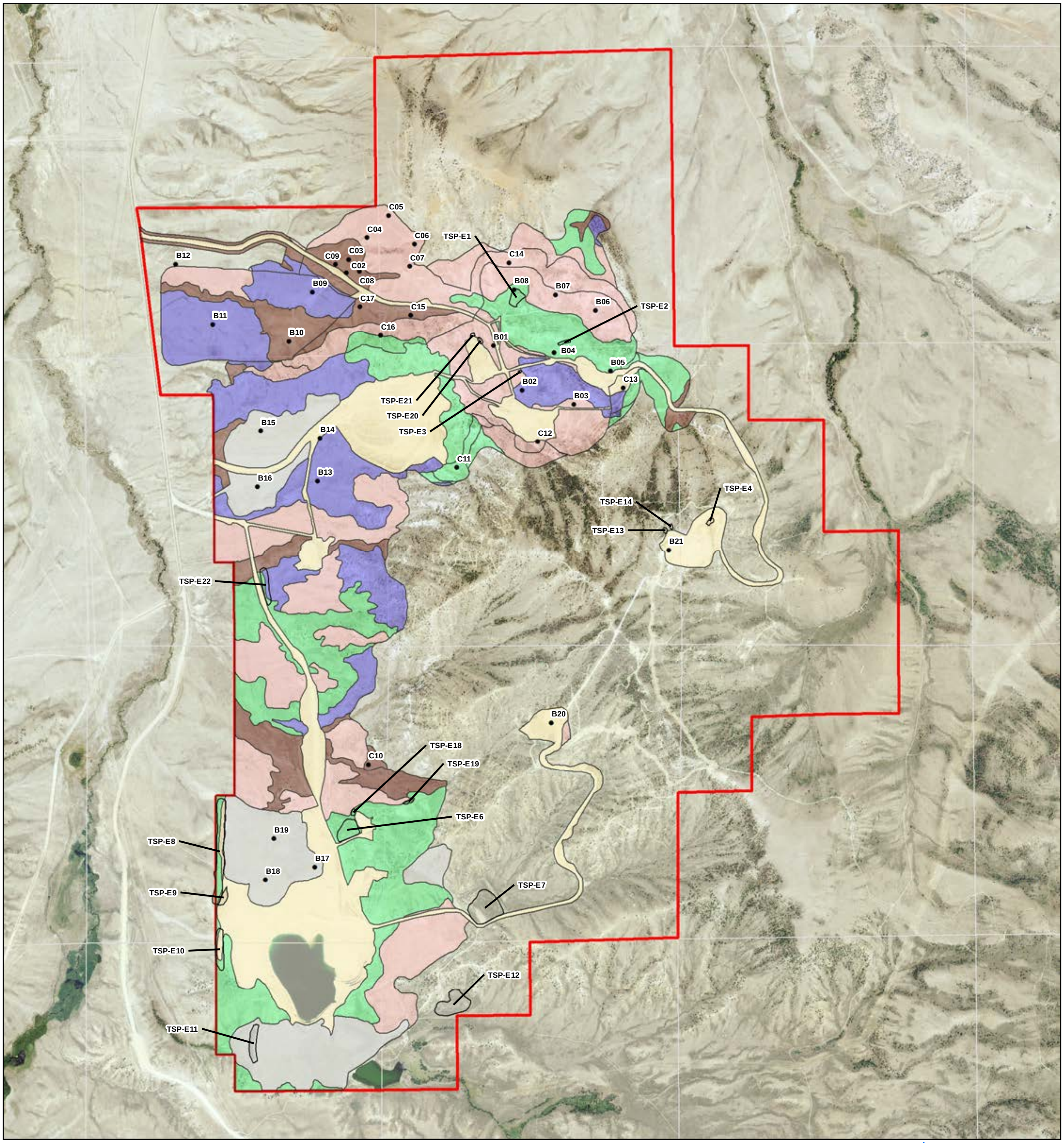
Sheep Mountain Project Area

Soils

117	125	158	193	223
119	136	175	202	229
120	140	183	204	231
121	141	188	219	

Data provided by U.S. Department of Agriculture, Natural Resources Conservation Service



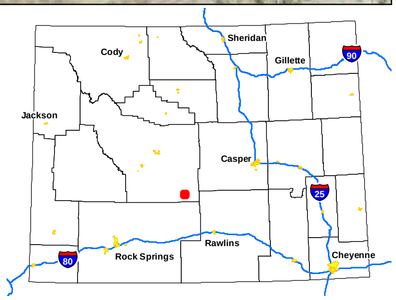


Map 3.2-8
BKS Surveyed Soils within the Project Area

0 1,000 2,000 3,000 Feet

Sheep Mountain Project Area
ExistingTopsoilStockpile
Soil Sample Location

MU Symbol - Soil Map Unit
BO - Bosler
CU - Cushool
D - Disturbance
ON - Onason
ON-RV - Onason/Reclaimed Varient
RO - Rock River



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3.2.4.2 NRCS Soil Map Units

There are 12 NRCS soil map units within the Project Area (see Map 3.2-7). Table 3.2-8 displays the acreage of each map unit, the soil reclamation potential, and the percentage of the map unit within the Project Area. Mapping completed by BKS only occurred within the BKS Sheep Mountain Soil Analysis Area, and did not include descriptions of the entire Project Area; therefore, for consistency in this analysis, the following acres by map unit are based off of NRCS data only.

Table 3.2-8
Soil Mapping Units within the Sheep Mountain Project Area

Map Unit Symbol	Soils Series	Substrate	Soil Reclamation Potential (LRP[1])	Acres	Percentage of Map Unit in Project Area
229	Dumps, Mine	N/A	N/A	677.1	18.6
223	Youga—Quander Complex	Alluvium	Low[b]	631.3	17.5
193	Rockinchair-Rock Outcrop-Sinkson Complex	Residuum Slope Alluvium Alluvium	High	537.5	14.9
188	Quander-Youga-Onason Complex	Alluvium Residuum	High	464.9	12.9
141	Dahlquist-Rock River Complex	Alluvium	High	363.8	10.1
121	Bosler--Ryan Park Fine Sandy Loams	Alluvium	High	302.6	8.4
136	Cragosen-Carmody-Blazon Complex	Residuum Slope Alluvium	Moderate	256.0	7.1
125	Brownsto very boulder – Decross variant –Brownsto Complex	Glaciofluvial Glacial deposits alluvium	High	115.9	3.2
204	Ryark Sandy Loam	Alluvium	High	42.5	1.2
119	Bluerim–Onason Complex	Residuum	High	37.8	1.0
120	Bosler-Rock River Sandy Loams	Alluvium	High	30.9	0.9
158	Havre-Forelle-Glendive Complex	Alluvium	High	35.9	1.0
175	Milvar-Milren Complex	Alluvium	Moderate to Low[a]	35.0	1.0
140	Cushool-Rock River Association	Residuum Slope Alluvium	Moderate	24.8	0.7
117	Blackhall-Carmody Association	Colluvium Alluvium Residuum	Low[a,b]	17.5	0.5
183	Peyton sandy Loam	Alluvium	High	18.8	0.5
219	Venapass-Silas Loams	Alluvium	High	11.9	0.3
202	Ryan Park Loamy Fine Sand	Alluvium	High	6.7	0.2
231	Water	N/A	N/A	0.4	<0.01
			Total	**3,611.3**	**100**

[1] According to the BLM Lander RMP (BLM, 2013a), landscapes that are difficult to revegetate are considered as having a LRP. Landscapes are characterized by highly sensitive and/or erosive soils, with severe physical or chemical limitations, and landforms with steep slopes over 25 percent. Limited physical or chemical factors include high level of salts that interfere with plant growth; soil textures with poor water holding capacity; coarse fragments that limit common practices and equipment; soil profiles that limit water-holding capacity and root zone limitations:
a) Soil textures with poor water holding capacity.
b) Coarse fragments that limit common rehabilitation practices and equipment.

According to the NRCS, generally, soil maps are grouped into units known as soil complex, association, undifferentiated group, or miscellaneous.

- A complex consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.
- An association is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps.
- An undifferentiated group is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management.
- Miscellaneous areas have little or no soil material and support little or no vegetation.

Dumps, Mine. This mapping unit occurs as an area of waste rock derived mainly from uranium mine spoils and waste rock material. Mine dump soils are located throughout the entire Project Area and represent the largest percentage of soils mapped.

Youga-Quander Complex. This map unit is composed of Youga loam and Quander cobbly loam and occurs on areas which have 2 to 25 percent slopes, and is formed in alluvium derived from various sources. This complex is located on all aspects of Sheep Mountain. These soils are very deep and well-drained with moderate permeability. The water capacity is moderate to high and effective rooting depth is 60 inches or more. The runoff is medium, hazard for water erosion is moderate, and hazard for wind erosion is slight to moderate. The resistance to dust propagation is moderate and the site degradation susceptibility is slight. Soil compaction resistance is low and the soil restoration potential is low.

Rockinchair-Rock Outcrop-Sinkson Complex. This map unit is composed of Rockinchair fine sandy loam, Rock outcrop, and Sinkson loam and occurs on areas which have 2 to 40 percent slopes. They are formed in residuum, slope alluvium, and mixed alluvium derived from shale interbedded with sandstone, and siltstone. They are located primarily in the northern part of the Project Area on all aspects and on the west aspect of Sheep Mountain. These soils are moderate to very deep and well-drained with a moderate permeability. The water capacity is moderate to high and effective rooting depth is 20 inches or more. The runoff is medium to rapid, hazard for water erosion is moderate to severe, and hazard for wind erosion is moderate to severe. The resistance to dust propagation is moderate and the site degradation susceptibility is moderate. Soil compaction resistance is low and the soil restoration potential is high.

Quander-Youga-Onason Complex. This map unit is composed of Quander cobbly loam, Youga loam, and Onason sandy loam and occurs on areas which have 10 to 45 percent slopes. They are formed in alluvium derived from various sources and residuum and slope alluvium derived dominantly from sandstone. They are located primarily on the ridge top and west aspect of Sheep Mountain. These soils are shallow to very deep and well-drained with a moderate to moderately rapid permeability. The water capacity is low to high and the effective rooting depth is 10 or more inches. The runoff is medium, hazard for water erosion is severe, and the hazard for wind erosion is slight to severe. The resistance to dust propagation is moderate and the site degradation is moderate. Soil compaction resistance is low and the soil restoration potential is high.

Dahlquist-Rock River Complex. This map unit is composed of Dahlquist very cobbly loam and Rock River sandy loam and occurs on areas which have 1 to 12 percent slopes. They are formed in alluvium derived from various sources. They are located primarily on the west and east aspect of Sheep Mountain. These soils are very deep and well-drained with a moderate permeability. The water capacity is low to high and the effective rooting depth is 60 inches or more. The runoff is slow to medium, hazard for water erosion slight, and the hazard for wind erosion is slight to severe. The resistance to dust propagation is moderate and the site degradation is slightly susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Bosler-Ryan Park Fine Sandy Loams. This map unit is composed of Bosler fine sandy loam and Ryan Park fine sandy loam and occurs on areas which have 1 to 8 percent slopes. They are formed in alluvium and eolian deposits derived from various sources. They are located primarily on the western and eastern border of the Project Area. These soils are very deep and well-drained with a moderate to moderately rapid permeability. The water capacity is moderate and the effective rooting depth is 60 inches or more. The runoff is slow, hazard for water erosion is slight, and the hazard for wind erosion is severe. The resistance to dust propagation is moderate and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Cragosen-Carmody-Blazon Complex. This map unit is composed of Cragosen gravelly loam, Carmody gravelly sandy loam, and Blazon sandy clay loam and occurs on areas which have a 6 to 40 percent slope. They are formed in residuum and slope alluvium derived from sandstone, conglomerate, and shale. They are located primarily on the west aspect of Sheep Mountain. These soils are very shallow to moderately deep and well-drained with a moderately slow to moderate permeability. The water capacity is low and the effective rooting depth is 4 to 40 inches. The runoff is rapid, hazard for water erosion is severe, and the hazard for wind erosion is slight to moderate. The resistance to dust propagation is moderate and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is moderate.

Brownsto Very Bouldery-Decross Variant-Brownsto Complex. This map unit is composed of Brownsto very bouldery sandy clay loam, Decross Variant sandy loam, and Brownsto sandy loam and occurs on areas which have a 1 to 50 percent slope. They are formed in glacial deposits, alluvium, and glacial drifts derived from glacial deposits and various other sources. They are located primarily on the east aspect of Sheep Mountain. These soils are very deep and well-drained with a moderate permeability. The water capacity is low to high and the effective rooting depth is 60 inches or more. The runoff speed is slow to medium, the hazard for water erosion is slight to moderate, and the hazard for wind erosion is slight to severe. The resistance to dust propagation is moderate and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Ryark Sandy Loam. This map unit is composed of Ryark sandy loam and occurs on areas which have a slope of 1 to 6 percent. They are formed in alluvium derived dominantly from sandstone and are located primarily in the southwestern part of the Project Area. These soils are very deep and well-drained with a moderately rapid permeability. The water capacity is low and the effective rooting is 60 inches or more. The runoff is slow, hazard for water erosion is slight, and the hazard for wind erosion is severe. The resistance to dust propagation is low and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Bluerim-Onason Complex. This map unit is composed of Bluerim sandy loam and Onason gravelly sandy loam and occurs on areas which have a 3 to 30 percent slope. They are formed in residuum and slope alluvium derived dominantly from sandstone. They are located primarily in the southwestern part of the Project Area. These soils are shallow to moderately deep and well-drained with a moderate to moderately rapid permeability. The water capacity is low and the effective rooting depth is 10 to 40 inches. The runoff is medium, hazard for water erosion is moderate, and the hazard for wind erosion is moderate. The resistance to dust propagation is low and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Bosler-Rock River Sandy Loams. This map unit is composed of Bosler sandy loam and Rock River sandy loam and occurs on areas which have a 1 to 8 percent slope. They are formed in alluvium derived from various sources. They are located primarily in the northeastern part of the Project Area on an east aspect. These soils are very deep and well-drained with a moderate permeability. The water capacity is moderate to high and the effective rooting depth is 60 inches or more. The runoff is slow, hazard for water erosion slight, and the hazard for wind erosion is severe. The resistance to dust propagation is low and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Havre-Forelle-Glendive Complex. This map unit is composed of Havre loam, Forelle loam, and Glendive sandy loam and occurs on areas which have a 0 to 3 percent slope. They are formed in alluvium derived from various sources and are located on the east aspect of Sheep Mountain and the southern part of the Project Area. These soils are very deep and well-drained with a moderately slow to moderately rapid permeability. The water capacity is moderate to high and the effective rooting depth is 60 inches or more. The runoff is slow, hazard for water erosion is slight, and the hazard for wind erosion is moderate to severe. The resistance to dust propagation is low and the site degradation is moderately susceptible. Soil compaction resistance is low and the soil restoration potential is high.

Minor Map Units. Other map units within the Project Area comprising less than 30 acres each consist of the Milvar-Milren Complex, Cushool-Rock River association, Blackhall-Carmody association, Peyton sandy loam, Venapass-Silas loams, Ryan Park loamy fine sand, and water. These units are present within the Project Area, but are not described in detail because they do not occur within the proposed disturbance areas and only occur in minor abundance.

3.2.4.3 BKS Soil Surveys

BKS completed Order 2 soil mapping in August 2010 (BKS, 2011a), with additional areas surveyed in September 2013 (BKS, 2014a). Actual soil boundaries were identified in the field by exposing soil profiles to determine the nature and extent of soil series within the Sheep Mountain Soil Analysis Area. Detailed soil mapping within the proposed disturbance areas was conducted using the same NRCS soil series found within the Project Area. Approximately 1,244.04 acres were surveyed in 2010. An additional 155.91 acres were surveyed in 2013, for a total of 1,399.95 acres surveyed. Over 37 soil profiles were exposed, sampled, and had corresponding profile descriptions written. A total of 16 of those sampled profiles were sent to the laboratory for analysis. Additionally, 11 of the 18 topsoil stockpiles, generally the largest of the stockpiles currently on site from previous disturbances, were sampled in June 2014 to verify viability for use as replacement topsoil.

BKS (2014a) grouped soils proposed for disturbance into five mapping units based on the existing NRCS survey information, but tailored the types to fit the detailed site-specific soil surveys. The five mapping units include Bosler fine sandy loam; Cushool sandy loam; Disturbance; Onason and Onason Reclaimed variant; and Rock River sandy loam (see Table 3.2-9).

The information from the soil surveys was used to determine the areal extent of topsoil and other suitable plant growth medium, and the salvage depths for these materials, and ultimately the replacement depths for these materials over the proposed Project disturbance area (Section 4.2.4). Salvage depths of topsoil suitable as a plant growth medium ranged from less than 0.5 to 1.79 feet (BKS, 2014a), exclusive of previously disturbed areas. Physical factors that limited the soil suitability consisted of low saturation percentages and coarse fragment percentages. Chemical factors that limited soil suitability include electrical conductivity (EC), SARs, and selenium (see Table 3.2-9). According to the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a), approximately 580,000 cubic yards of topsoil would be salvaged during mining operations.

The presence of suitable plant growth medium or coversoil, in addition to topsoil, was also evaluated, and potential salvage thicknesses ranged from about 1.54 to 2.86 feet. Based on these depths, up to 2,000,000 cubic yards of potential salvageable plant growth medium (coversoil) could be salvaged and stockpiled, depending on accessibility and percentage of large rocks and boulders in the material.

Topsoil stockpiles present with the Project Area can also contribute an additional 220,000 cubic yards of topsoil material. Long-term stockpiled topsoil becomes degraded through the alteration/loss of soil structure, increased bulk density, chemical changes, reduced nutrient cycling, reduced microbial activity, and a reduction in viable plant propagules and seed (Storhmayer, 1999). As part of the soil surveys (BKS, 2014a), the viability of the existing topsoil stockpiles were assessed via sampling and testing at the request of the BLM. The only concern noted with respect to the existing stockpiles was that three of the eighteen stockpiles were noted as being very rocky.

Table 3.2-9
Soil Reclamation Potential and Limiting Topsoil Suitability Characteristics

Mapping Unit [1]	Acres within BKS Study Area (%)	Soil Reclamation Potential (LRP[2])	Soil Sampling Results and Limiting Topsoil Suitability Characteristics			
			Suitable Topsoil Salvage Depth[3] (feet)	Coversoil Salvage Depth[3] (feet)	Marginal Parameters	Unsuitable
Bosler (BO) fine sandy loam	158.77 (11.34%)	Low (a, b, d)	1.13	1.99	Saturation, Coarse Fragments	Sodium Absorption Ratio
Cushool (CU) sandy loam	270.27 (19.31%)	Moderate (a, c)	0.47	2.86	Saturation	N/A
Disturbance (D)	337.34 (24.10%)	N/A	Not Available			
Onason (ON) and Onason/Reclaimed Variant (ON-RV)	543.19 (38.80%)	Moderate (a, c)	0.31	2.35	Saturation	N/A
Rock River (RO) sandy loam	90.38 (6.46%)	High (d)	1.79	1.54	Saturation, SAR, EC, Selenium, pH	Sodium Absorption Ratio, pH
Total	**1,399.95**					

[1] Soil mapping units and characteristics are based on BKS (2014a).
[2] According to the BLM Lander RMP (BLM, 2013a), landscapes that are difficult to revegetate are considered as having a LRP. Landscapes are characterized by highly sensitive and/or erosive soils, with severe physical or chemical limitations, and landforms with steep slopes over 25 percent. Limited physical or chemical factors include high level of salts that interfere with plant growth; soil textures with poor water holding capacity; coarse fragments that limit common practices and equipment; soil profiles that limit water-holding capacity and root zone limitations:
a) Soil textures with poor water holding capacity.
b) Coarse fragments that limit common rehabilitation practices and equipment.
c) Soils that have a lithic, paralithic, or other restrictive soil layer within 60 inches of the soil surface. These soils have shallow profiles and hold less available water for plant growth.
d) Soils that are saline or sodic – rating when the conductivity is greater than 8 micromhos per centimeter (mmhos/cm) or the SAR is greater than 12, or both.
[3] The proposed salvage depths are from Appendix B in the BKS report (BKS, 2014a).

3.2.4.4 Radiological Background

In 2010 and 2011, field investigations were conducted within the Sheep Mountain Project Area to determine baseline gamma levels and corresponding radium-226 levels (see Section 3.4.7, Public Health and Safety) in soils on behalf of Energy Fuels (WDEQ, 2015a). The survey better defined the baseline Natural Occurring Radiological Materials (NORM) and Technically Enhanced Naturally Occurring Materials (TENORM). The objectives of the baseline radiological survey and sampling were to:

1. Establish the nature of the pre-mining radiological environment.
2. Detect and document areas having anomalous radiation.
3. Establish pre-mining concentrations of radionuclides in the surface materials of the lands to be affected in order to establish a goal for reclamation.

In general, the Project Area shows relatively high radiological background gamma due to both NORM and TENORM concentrations of radium-226 and other radionuclides in the near surface soils. Elevated NORM is due to outcropping mineralized zones within the Battle Spring Formation. Elevated TENORM reflects the more than 30 years of historical mining and exploration in the Project Area and vicinity.

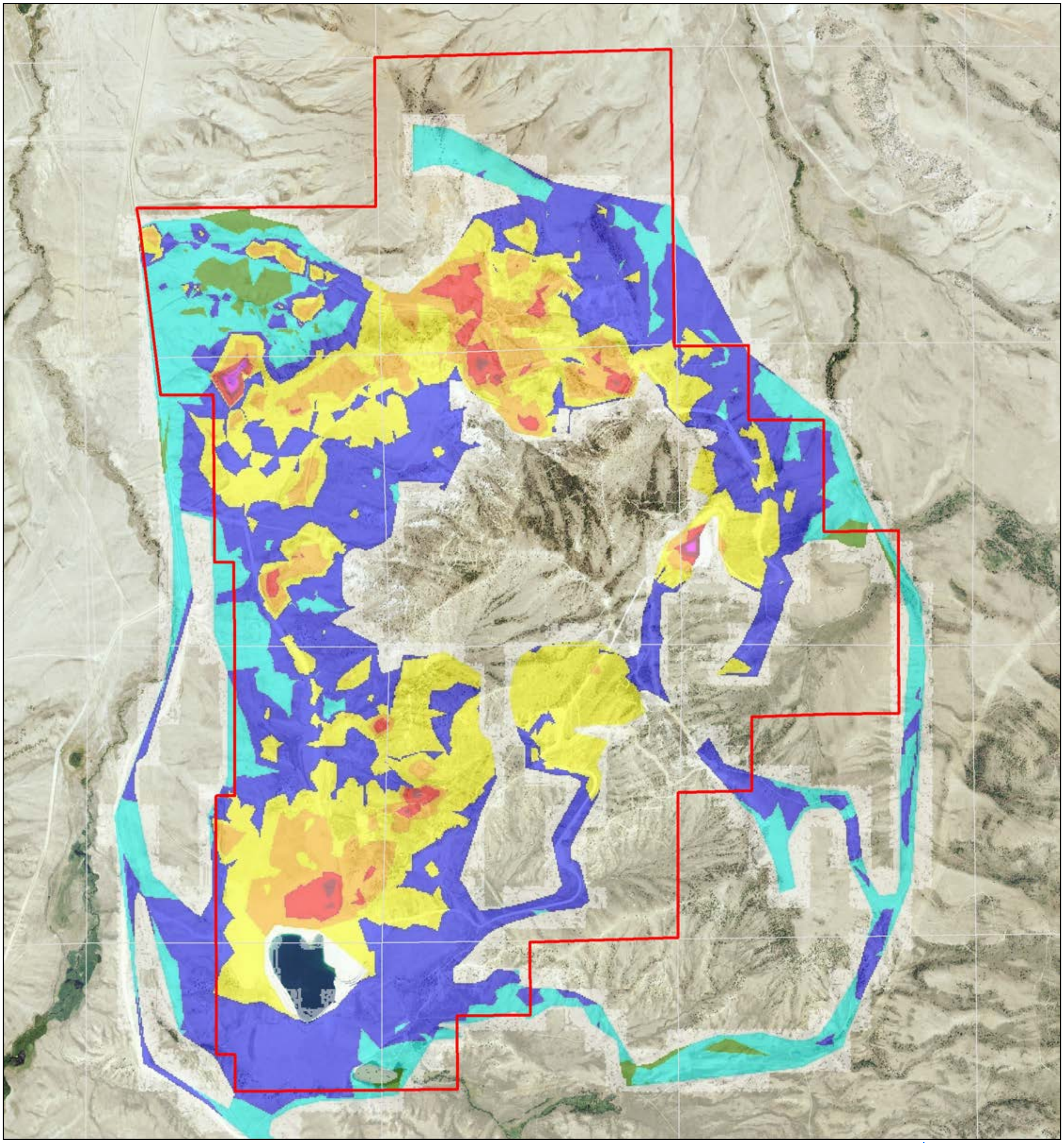
The portions of the Project Area where the surface is underlain by Cody Shale, Fort Union Formation, and/or Quaternary alluvial and colluvial deposits derived from these formations exhibit the lowest background gamma levels and are generally less than 50 microRoentgens per hour (μR/hr). In contrast, areas which are underlain by the Battle Spring Formation and/or Quaternary alluvial and colluvial deposits derived from the Battle Spring Formation exhibit background levels in excess of 50 μR/hr with natural outcrop areas (NORM) exhibiting levels in excess of 75 μR/hr. TENORM levels are related to historic mine operations and may include mine spoils, low grade ore stockpiles, and surface mines. Current existing TENORM levels exceed 150 μR/hr in most cases (WDEQ, 2015a). Soil samples were extracted at locations selected to cover the range of common exposure rates found on-site. The surveyed area had a wide range of exposure rates.

The gamma/radium-226 correlation analysis results demonstrate a strong correlation between radium-226 soils concentration and gamma exposure rate for the soils correlation plots analyzed. Based on these correlations, approximately 70 μR/hr measured in the field would equate to approximately 20 picocuries per gram (pCi/g) radium-226 at the surface.

Exposure rates ranged from 12.9 to 1138 μR/hr, with a standard deviation of 42.3 μR/hr. The survey data are mapped (see Map 3.2-9) to illustrate exposure rate variations seen over the entire site. Gamma exposure rates observed at the soil correlation plot locations ranged between 20.2 μR/hr and 423 μR/hr, with a standard deviation of 128 μR/hr.

3.2.5 Water (Surface, Groundwater, and Water Rights and Water Use)

The location of the Sheep Mountain Project Area is on the divide between the Sweetwater River Drainage (in the North Platte River Drainage system) and the Great Divide Basin (see Map 3.2-10), and the associated topography and geology result in a relatively unusual hydrologic setting, which is described in more detail in the following sections. In particular, surface water flows are generally to the north-northeast into the Sweetwater River Drainage and the groundwater is generally to the west-southwest into the Great Divide Basin.



Map 3.2-9
Surface Gamma Map

N

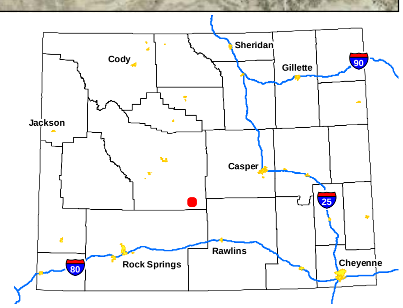
0 1,000 2,000 3,000
Feet

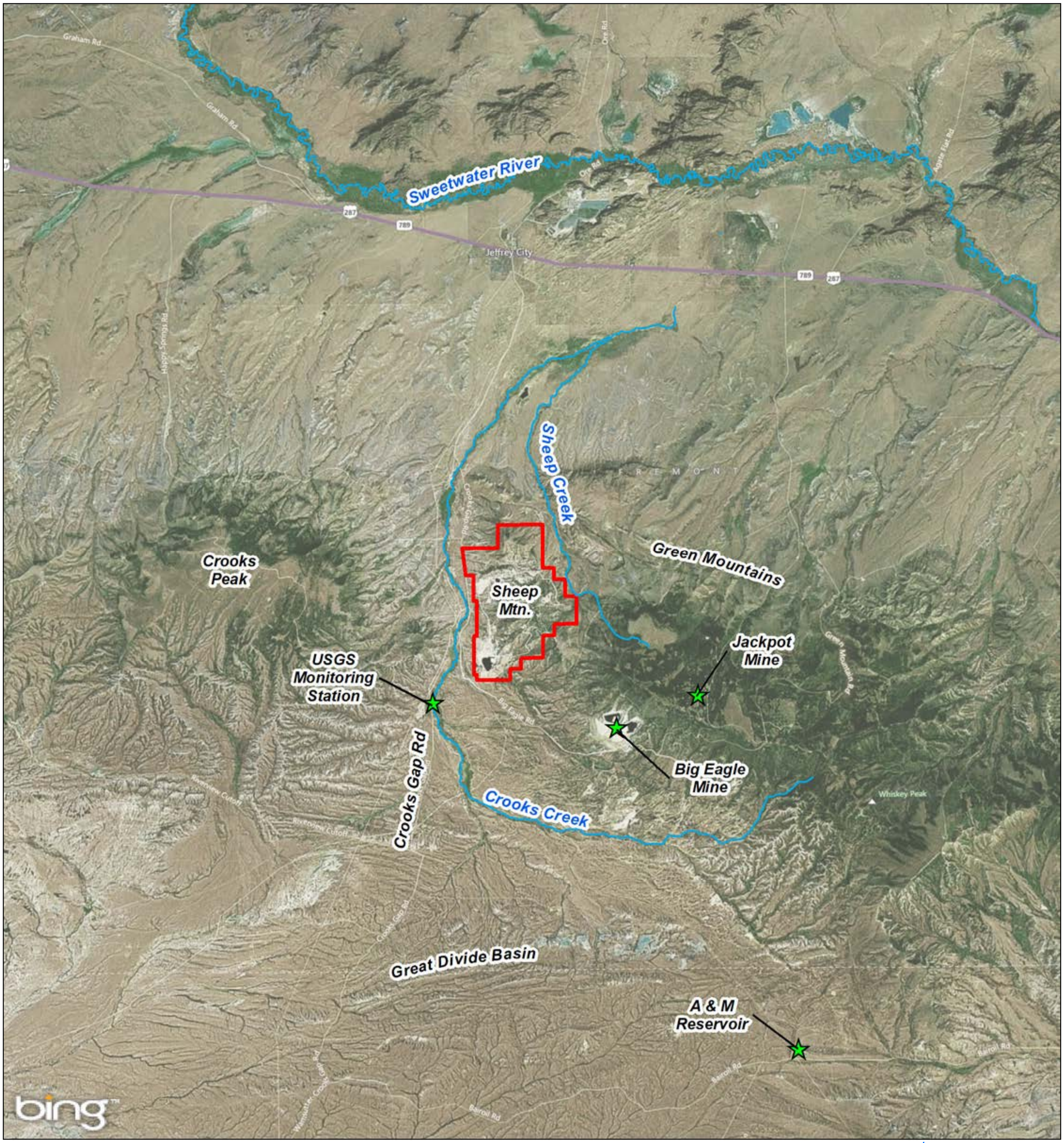
No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

Sheep Mountain Project Area

Gamma Exposure Rate (uR/hr)

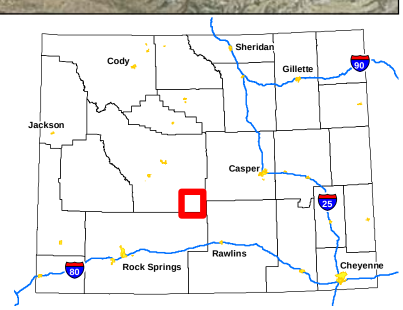
< 25	50 - 75	300 - 450
25 - 35	75 - 150	450 - 600
35 - 50	150 - 300	600 - 900
		> 900





Map 3.2-10
Surface Water Drainages Near Crooks Gap

Sheep Mountain Project Area



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No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

3.2.5.1 Surface Water

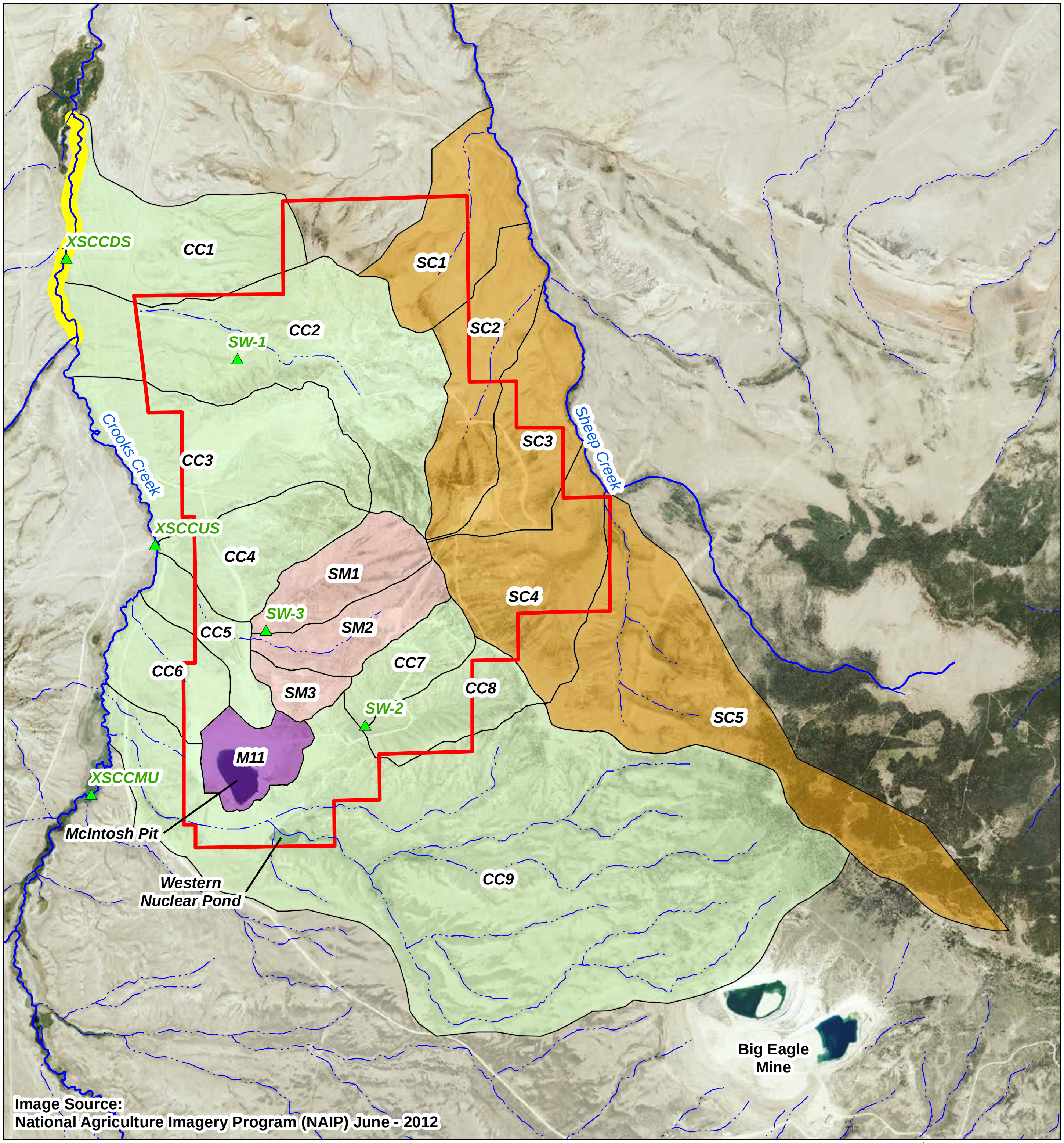
The USGS (2013) places Sheep Mountain within the Sweetwater River Drainage. The Sweetwater River originates in the high mountains of the southern Wind River Range and flows along the southern margin of the Wind River Basin and northern margin of the Great Divide Basin to the Granite Mountains and Devils Gate. The river drains a total of 2,338 square miles (USGS, 2010b). Pathfinder Reservoir, in Natrona County, is where the Sweetwater River joins the North Platte River and flows north. The North Platte River flows approximately 450 miles through Colorado, Wyoming, and Nebraska; and the Sweetwater River is its largest tributary (USGS, 2010b). The North Platte River drainage basin is ultimately part of the greater Missouri-Mississippi River Basin.

All of the surface water flow off the Project Area is ephemeral, and these ephemeral drainages are tributary to two perennial drainages: Crooks Creek to the west of the Project and Sheep Creek to the east of the Project (see Map 3.2-10). The divide between these drainages runs north-south through the Project Area along the top of Sheep Mountain, which roughly coincides with the northeastern edge of the Project Area (see Map 3.2-11). As a result, the majority of site runoff drains to Crooks Creek. Both creeks are within the Sweetwater River Drainage but dissipate before reaching the Sweetwater River (Stephens, 1964).

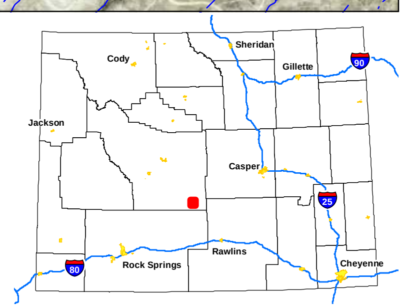
Two perennial impoundments occur in the Project Area (see Map 3.2-11), the McIntosh Pit and an officially unnamed pond at the south end of the Project Area. The McIntosh Pit was created by mining in the 1970s. The pit receives recharge from groundwater and a minor amount of runoff and precipitation from a very limited catchment area and does not discharge water. The unnamed pond is locally called Western Nuclear Pond (also known as Fish Pond or McIntosh No. 2 Pond) because it was also created during uranium operations by Western Nuclear decades ago. Western Nuclear Pond was created by reclaimed mine overburden material truncating ephemeral drainages to Crooks Creek. The pond receives recharge from runoff and precipitation from a significantly larger catchment area than the McIntosh Pit (Lidstone and Associates, Inc. – Lidstone, 2013), and most of the catchment area above Western Nuclear Pond is also undisturbed. On-going WDEQ-AML work at the McIntosh Pit includes highwall reduction and backfilling the pit above the water table (WDEQ-AML Project 16-O), and at the Western Nuclear Pond includes constructing a low permeability impoundment structure core (WDEQ-AML Project 16-O-2B). As discussed in Sections 2.5 and 5.3.1, Energy Fuels originally had partial responsibility for reclamation of the McIntosh Pit, but to facilitate the more extensive pit reclamation by WDEQ-AML, Energy Fuels turned over the amount of the Permit 381C reclamation bond allocated to that work to WDEQ-AML.

There are also three permitted ephemeral impoundments, SW-1, SW-2, and SW-3, associated with historic mining activities at the site (see Map 3.2-11). These impoundments do not discharge water to the surface. Two of the impoundments, SW-1 and SW-2, are located on ephemeral drainages to Crooks Creek. Impoundment SW-3 intercepts ephemeral drainages to Crooks Creek which were truncated by a road associated with historic mining activities (Lidstone, 2013). Of the eighteen attempts to sample the impoundments between April 2010 and June 2014, the impoundments were dry all but five times for SW-1, all but four times for SW-2, and all but three times for SW-3. One of these impoundments, SW-1, would be removed during construction of the Hanks Draw Spoils Facility and would not be replaced as part of reclamation.

Eighteen ephemeral drainage basins dissect the Project Area (see Map 3.2-11). These drainages are generally steep and well-defined in the higher elevation areas, becoming less channelized in the lower portion. The drainages tend to transport sediment derived from exposed outcrop, local soils, and material uncovered from historic mining activity.



Map 3.2-11
Ephemeral Drainage Basins in the Project Area



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No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

- Sheep Mountain Project Area
- Crooks Creek Subbasins
- McIntosh Pit Basin
- Sheep Creek Subbasins
- Sheep Mountain Subbasins
- 305b Water Quality - Category 5

Sheep Creek Characteristics

Sheep Creek is a perennial creek that originates just southeast of the Project Area boundary and flows north before joining Crooks Creek and disappearing in sand (see Map 3.2-10). Two small ephemeral tributaries to Sheep Creek originate within the eastern edge of the Project Area boundary along the steep slopes of Sheep Mountain (see Map 3.2-11). Because of the extent of Cody Shale on the east side of the Project Area, no groundwater flow from the Project Area contributes to Sheep Creek (Section 3.2.5.2, below).

Sheep Creek is a low discharge creek (approximately 50 cfs 10 year peak) that does not always flow year-round. The WDEQ-WQD classifies Sheep Creek as Class 2AB (WDEQ, 2013).

Crooks Creek Characteristics

Crooks Creek originates to the south of Green Mountain and flows westward along the base of Green Mountain (Map 3.2-10). South of Crooks Gap, the creek turns northward through the Gap where it flows across the Cody Shale, loses gradient, and becomes intermittent before disappearing in sand. Surface waters from Crooks Creek never reach the Sweetwater River (Stephens, 1964). This unusual characteristic of Crooks Creek is due to the geologic setting of the region, in particular the presence of the Sweetwater Plateau north of Crooks Gap. The gradient of Crooks Creek reduces from about 200 feet per mile south of Crooks Gap to less than 50 feet per mile north of the Gap. North of the Gap, the water in the creek soaks into the porous sandstone in the Sweetwater River Drainage, to the extent that there is no channel of the creek extending to the Sweetwater River (Love, 1970). The creek disappears more than a mile from the river, and the groundwater in the area of the creek disappearance has been interpreted as flowing to the east, parallel to the Sweetwater River (Borchert, 1987).

Adjacent to the Project Area, cross sections of Crooks Creek and its associated ephemeral drainages were surveyed to determine hydrological and morphological characteristics (Lidstone, 2013). The creek oscillates between a sinuous single thread meandering channel and a braided channel; where, during low flow, water moves as subsurface and surface flow. Generally, channels range from steep and incised along meander bends to more gradual along straight sections. Average sinuosity is 1.4 (unit-less ratio) through the meandering sections (meandering streams have sinuosity of 1.3 and greater).

In 2010, Energy Fuels placed three gaging sites on Crooks Creek, including locations upstream (XSCCMU), adjacent to (XSCCUS), and downstream (XSCCDS) of the Project Area. The locations of the gaging sites are shown on Map 3.2-11, and Photos 3.2-2 through 3.2-4 show Crooks Creek near each of the gaging sites (Lidstone, 2013). Energy Fuels has also installed a weir near the location of XSCCUS. Crooks Creek drains approximately 90 square miles above the gaging site XSCCDS. Recorded flows have ranged from 1.8 cfs in August 2012 to 13.5 cfs in November 2013 (see Table 1 in Appendix 3-B). The variation in the creek flows is not unexpected given the variability in precipitation and snow melt in the region (Section 3.2.1.1).

Photo 3.2-2
Crooks Creek Gaging Site XSCCMU, May 2011

Photo 3.2-3
Crooks Creek near Gaging Site XSCCUS, June 2010

Photo 3.2-4
Crooks Creek Gaging Site XSCCDS, June 2010

For comparison, discharge measurements are available between 1961 and 1981 at a USGS gaging station on the West Fork of Crooks Creek, which drains an area of about 12 square miles. The discharges ranged from 0.5 cfs on June 30, 1977 to 255 cfs on July 10, 1975 (see Table 2 in Appendix 3-B).

Comparison of the available, contemporaneous flow measurements conducted along Crooks Creek (Table 1 in Appendix 3-B) indicates the increases in the flow rates in Crooks Creek from upstream to downstream locations are generally less than 15 percent of the flow rates, and in some cases there is no change or a reduction in the flow rate. The changes in the flow along the creek can be attributed to measurement difficulties, evaporation, inflow/outflow to groundwater (from both sides of the creek), and contributions from the ephemeral tributaries to Crooks Creek.

Ephemeral Drainage Characteristics

The ephemeral drainages in the Project Area include drainages that have not been affected by historic mining and reclamation but also include drainages that have been affected along a portion of their length. At the higher elevations on Sheep Mountain, the ephemeral drainages are generally steep and well-defined. The drainages, while often dry, exhibit discontinuous headcuts within the channel profile, reflecting natural adjustments to the channel grade, most likely due to the ephemeral nature of the summer thunderstorm events and headcut migration towards the drainage divide. As channel slope decreases in the downstream direction from Sheep Mountain to the Crooks Creek floodplain, channel substrate transitions from large boulders to a sand bed and the depth of incision increases. The middle sections of the ephemeral drainage profiles are typified by deeply incised, slightly sinuous channels with sandy beds. As watershed area increases downstream and topography continues to flatten, discharge disperses and channelized flow is often no longer present. On the Project scale, the site's watershed morphology is typical of a desert bajada landform, where alluvial fans coalesce. This is pronounced on the western edge of the Project Area, between the north-south road leading to the McIntosh Pit and Crooks Creek. In most cases, flow disperses from its channelized condition to sheet flow and then is collected again in a roadside ditch before it enters Crooks

Creek (Lidstone, 2013). Photos 3.2-5 through 3.2-7 illustrate the ephemeral drainage characteristics in the upper, middle, and lower stretches of the drainages (Lidstone, 2013).

Historic mining and reclamation have affected the ephemeral drainages in the Project Area in different ways. For example, Hanks Draw was used for dewatering discharges in the 1970s and 1980s. The drainage in the vicinity of the Paydirt Pit was partially reconstructed during the WDEQ-AML reclamation of the pit several years ago, although there is still a closed depression at the pit location (SW-1 impoundment). The conditions in each of the eighteen drainage basins in the Project Area (see Map 3.2-11) are described in more detail in Appendix D-6 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

Photo 3.2-5
Ephemeral Drainage at Higher Elevation in Project Area Drainage Basin SC4, June 2010

Photo 3.2-6
Ephemeral Drainage at Lower Elevation in Project Area Drainage Basin CC8, August 2010

Photo 3.2-7
Ephemeral Drainage at Lower Elevation in Project Area Drainage Basin CC5, August 2010

Surface Water Quality

Surface water quality samples have been collected since May 2010 from Crooks Creek to the three gaging sites on the creek (see Map 3.2-11). This recent water quality data was compared with older water quality data from an upstream location on the creek, near the Jackpot Mine (see Map 3.2-10), and from the West Fork of Crooks Creek at the USGS gaging station. Samples have also been collected from the McIntosh Pit and Western Nuclear Pond. Attempts to collect streamflow samples from the ephemeral drainages were not successful due to the short duration, infrequent flow events in these tributaries. To represent the ephemeral flows, the three ephemeral surface water impoundment sites (SW-1, SW-2, and SW-3) were sampled (see Map 3.2-11). The surface water sampling history for this Project is summarized in Table 3 in Appendix 3-B.

Table 4 in Appendix 3-B includes the regulatory criteria used for evaluation of the surface water quality data. The table includes WDEQ-WQD surface water standards. It also includes WDEQ-WQD groundwater classification criteria and EPA drinking water criteria. The groundwater criteria are included because they provide insight on the parameter concentrations of concern to various water uses, e.g., livestock. Similarly, the EPA drinking water criteria, including the secondary guidelines, are included because they provide insight on what would be necessary for a public water supply system.

Crooks Creek. In general, the water quality in Crooks Creek at Energy Fuels' monitoring stations meets the WDEQ-WQD and EPA standards (Table 4 in Appendix 3-B). The exceptions are for parameters that could be expected to be elevated in this region, e.g., iron, manganese, nitrogen (ammonia), gross alpha, and uranium; however, the elevated concentrations are not consistent. They may only occur as a maximum in the results, such as during high runoff, and they are generally associated with analyses of unfiltered samples (i.e., 'total' or 'suspended' analyses). There is no readily apparent, consistent increase or decrease of parameter concentrations from the upstream to downstream sampling locations.

Analyses for physical parameters included: pH, conductivity, total dissolved solids (TDS), total suspended solids (TSS), and turbidity (Table 5 in Appendix 3-B). Data collected from water in Crooks Creek indicated slightly alkaline conditions (average pH=8.3), and a low concentration of suspended solids. Dissolved solids were measured to be fairly high, but did not exceed secondary maximum contaminant levels (SMCLs) for public water systems as defined by 40 CFR § 143.3. The electrical conductivity within Crooks Crook was measured to be average for a freshwater stream, with average freshwater streams ranging from 100 to 2,000 micromhos per centimeter (µmhos/cm) (Lidstone, 2013). Turbidity changes seasonally with discharge and sediment influx but averages 5.4 Nephelometric Turbidity Units (NTU) in Crooks Creek. Most treatment plants for drinking water in the U.S. produce water with turbidity lower than 0.3 NTU (EPA, 2013b).

Major anion and cation concentrations are also listed in Table 5 in Appendix 3-B. Water in Crooks Creek was measured to have a neutralizing alkalinity between 100 and 200 milligrams per liter (mg/l). Sulfate and fluoride concentrations were well under the SMCLs. Sodium, calcium, and silicate (solid) were all found to be less than 50 mg/l and are unlikely to be a significant contribution to adverse health effects in drinking water (EPA, 2011a).

Most dissolved metal concentrations were below the laboratory detection limits with a few exceptions. Arsenic ranged from <0.001 to 0.008 mg/l, iron ranged from <0.05 to 0.18 mg/l, and manganese ranged from <0.02 to 0.08 mg/l. Boron, selenium, and zinc were present in a few samples, but the concentrations did not exceed 0.2, 0.002, and 0.1 mg/l, respectively. None of the detected concentrations exceeded established state and federal water quality criteria (Table 4 in Appendix 3-B), with the exception of the one manganese concentration at 0.08 mg/l. The average sample concentration was below the established criteria. Concentrations of iron and manganese in unfiltered samples were higher, ranging up to 1.5 and 0.11 mg/l, respectively.

Analyses for uranium and radionuclides indicated Crooks Creek contains detectable concentrations of these parameters. Dissolved uranium was present in all the samples, and the concentrations ranged from 0.0094 to 0.0279 mg/l, compared to the regulatory criteria of 0.03 mg/l. Concentrations of suspended uranium were higher, ranging up to 0.287 mg/l. Radium-226 concentrations in filtered samples ranged from 0.5 to 2.1 picocuries per liter (pCi/l), compared to the regulatory criteria of 5 pCi/l. Suspended radium-226 concentrations were somewhat higher, ranging up to 7.1 pCi/l. The regulatory criterion is 15 pCi/l for adjusted gross alpha, i.e., gross alpha activity excluding uranium and radon activity. Unadjusted gross alpha concentrations ranged from about 9 to 49 pCi/l. Dissolved gross beta ranged from 1.6 to 10.4 pCi/l. Lead-210, polonium-201, and thorium-230, were only present in some samples, with the highest concentrations in the filtered samples being 5.3, 1.3, and 0.59 pCi/l, respectively.

For comparison, the recent sampling results were compared with historic water quality sampling data collected from Crooks Creek a few miles upstream of the Project Area, at the Jackpot Mine and at the USGS gaging station (see Map 3.2-10). The data from the baseline sampling at Crooks Creek near the Jackpot Mine included essentially the same parameters as the sampling for the Project (BLM, 1995). The data from the USGS gaging station is limited to physical parameters and major ions (USGS, 2015). The sampling results from Crooks Creek near the

Jackpot Mine indicate the water was slightly less alkaline than the water from Crooks Creek adjacent to the Project Area, with slightly less sulfate, slightly more chloride, and a slightly higher carbonate-bicarbonate ratio. In general, the dissolved trace metal concentrations, including uranium, were also slightly higher, or showed a somewhat greater range in concentrations, at the upstream location, and radium-226 concentrations were about the same. The sampling results from Crooks Creek at the USGS gaging station indicate the water quality is essentially the same as that measured adjacent to the Project Area; the only difference being more consistent detection of boron, although at very low concentrations.

The WDEQ-WQD classifies Crooks Creek as Class 2AB (WDEQ, 2013), although a segment of Crooks Creek is listed as a Category 5 impaired stream for oil and grease contamination (WDEQ, 2012a). The segment is downstream of the Project Area and is in the SWNE ¼ of Section 18 T28N R92W (WDEQ, 2012a). According to the WDEQ-WQD, ambient monitoring of Crooks Creek revealed a significant amount of oil in sediments, a violation of water quality standards. The source of oil is unknown at this time. WDEQ-WQD indicated the stream was scheduled for development of Total Maximum Daily Loads (TMDL) in 2012; however, it has not been completed (Hyatt, 2014). According to WDEQ (Hyatt, 2014), there is no recent evidence of oil and grease. WDEQ will need to collect biological, chemical, and water quality samples for 2 years before the stream segment can be delisted from Category 5. Crooks Creek is considered a low priority; therefore, it could take a few years for the assessment to be completed (Hyatt, 2014).

McIntosh Pit and Western Nuclear Pond. Analytical results for surface water samples collected from McIntosh Pit and Western Nuclear Pond are listed in Table 6 in Appendix 3-B. As discussed in Sections 2.5 and 5.3.1, Energy Fuels originally had partial responsibility for reclamation the McIntosh Pit through WDEQ-LQD Permit to Mine 381C, which is the reason water quality data has been collected from these features for several years. However, to facilitate the complete McIntosh Pit reclamation by WDEQ-AML, Energy Fuels turned over the amount of the Permit 381C reclamation bond allocated to that work to WDEQ-AML. The WDEQ-AML work addresses both the pit reclamation and improvements to Western Nuclear Pond.

In general, the water in Western Nuclear Pond is of better quality than the water in McIntosh Pit, because of the larger, less disturbed drainage to Western Nuclear Pond and lack of groundwater inflow. The water quality in both ponds will change because of the on-going WDEQ-AML reclamation work. The addition of a low permeability impoundment structure core to Western Nuclear Pond should have limited impact on the water quality once construction is completed. The water quality in McIntosh Pit should improve because the inflow of groundwater from mineralized zones in the vicinity of the pit will be curtailed by the backfilling of the pit above the water table.

Currently, the water in both McIntosh Pit and Wester Nuclear Pond is slightly alkaline (average pH of 8.3 and 8.5, respectively). TDS concentrations in McIntosh Pit are relatively high (average just over 500 mg/l), but are much lower in Western Nuclear Pond (average about 240 mg/l). Concentrations of major cations and anions, are also generally higher in McIntosh Pit, although all are below current regulatory criteria, with the exception of high sulfate concentrations from McIntosh Pit (Table 6 in Appendix 3-B).

Dissolved trace metals concentrations are almost all below laboratory detection limits, and below current regulatory criteria, with the exception of uranium. Total concentrations of iron and manganese are above regulatory criteria in Western Nuclear Pond. For uranium and radionuclides, the concentrations in McIntosh Pit are in excess of current regulatory criteria, and well in excess of the concentrations reported for Western Nuclear Pond. Although reported concentrations of suspended uranium are below the regulatory criteria of 0.3 mg/l, the average dissolved uranium concentration in McIntosh Pit was over 3 mg/l, but was less than 0.08 mg/l in

Western Nuclear Pond. Gross alpha was also over regulatory criteria in both locations, but the concentration in McIntosh Pit was over ten times the concentration in Western Nuclear Pond. Although radium concentrations in McIntosh Pit exceeded the regulatory criteria of 5 pCi/l, the concentrations in Western Nuclear Pond were less than the criteria.

Ephemeral Impoundments (SW-1, SW-2, and SW-3). The analytical results of the water quality sampling of these impoundments are summarized in Table 7 in Appendix 3-B. As noted previously, these impoundments were dry most of the time. The results of the water quality analyses from each pond showed considerable variability, which would be expected given the ephemeral nature of the flows to the impoundments. For example, in SW-1, the TDS concentrations varied from 100 to just over 7,000 mg/l. In addition, there was considerable variability in the results among the impoundments. In general, the highest concentrations were detected in SW-1 and the lowest concentrations were detected in SW-3. With respect to regulatory standards, the parameters in exceedance included aluminum, iron, manganese, uranium, gross alpha, and radium. In at least one sample from SW-1, several other parameters, such as TDS, were in exceedance, probably due to runoff relatively recent to the sampling event. Historic mining, as well as naturally occurring mineralization, are the causes for the impaired water quality at these locations, particularly SW-1. Most of the land in the drainage above SW-1 is historic disturbance; in contrast, most of the land in the drainages above SW-2 and SW-3 is undisturbed or reclaimed.

3.2.5.2 Groundwater

Groundwater occurrence and movement in the Sheep Mountain area is heavily influenced by the geologic setting, described in Section 3.2.2.2. Even though all surface water within the Project Area drains to the north-northeast into the Sweetwater River Drainage, as described in Section 3.2.5.1, the geologic setting results in groundwater flow to the west-southwest into the Great Divide Basin (see Map 3.2-10).

Crooks Gap and the Project Area are on the northeast margin of the Great Divide Basin, and the topographic low within the Basin is about 30 miles to the southwest of the Project Area. Groundwater in the aquifers within the Great Divide Basin, which is an internally drained hydrologic basin, will usually flow from the recharge areas at higher elevations around the Basin margins towards the topographic low, which is characterized by playa lakes (Welder and McGreevy, 1966; Mason and Miller, 2005). To the north of Crooks Gap, groundwater occurs in a different aquifer and flows towards the Sweetwater River (Borchert, 1977).

<u>Regional Groundwater Occurrence</u>

The aquifers within the Great Divide Basin are described first, followed by a description of the aquifer in the Sweetwater River drainage north of Crooks Gap.

Great Divide Basin. The Tertiary-aged rocks in the Great Divide Basin that make up the regional aquifer system include the Wasatch, Battle Spring, and Fort Union formations. The combined thickness of the Wasatch, Battle Spring, and Fort Union formations ranges from a few tens of feet along the basin margins to several thousand feet in the deepest portion of the Basin.

The Wasatch Formation consists of interbedded sandstones, mudstones, siltstones, and lignites. It is the shallowest formation comprising a regional aquifer in the Great Divide Basin. Groundwater characteristics of the Wasatch Formation differ within the Basin, and are dependent upon the lithology. Data collected from 104 wells sourced from the Wasatch Formation showed yields ranging from 1 to 1,300 gpm and transmissivities range from about 25 to 135 square feet per day (ft^2/day) (Mason and Miller, 2005). However, the Wasatch Formation is not generally present along the Basin margins, such as the vicinity of the Project Area (Sullivan, 1980).

The Battle Spring and Wasatch formations are often grouped together and have similar aquifer characteristics, in part because of lithologic similarities and interbedding. The Battle Spring Formation is considered a mountain-ward fluviatile facies of the Wasatch Formation and is composed of fine- to coarse-grained sandstones, minor conglomerates, siltstones, and mudstones. Saturated thickness varies throughout the Great Divide Basin, but the aquifer functions as a single heterogeneous, anisotropic aquifer when saturated except where scattered discontinuous aquitards are present (Welder and McGreevy, 1966). Collentine and others (1981) reported wells in the Battle Spring Formation with yields as high as 150 gpm but generally yields between 30 and 40 gpm. Data obtained from pump tests in 26 wells indicated transmissivity values in the Battle Spring Formation between 4 and 400 ft^2/day (Collentine et al., 1981).

The Fort Union Formation consists of fine- to coarse-grained sandstone with carbonaceous shale and coal, siltstone and claystone and often forms discontinuous lenses of sandstone and conglomerate. The sandstones within the Fort Union Formation make up 50 percent of the formation and provide plentiful water that is generally heavily mineralized (Welder and McGreevy, 1966). Compared to the Battle Spring Formation, the water-bearing layers in the Fort Union Formation are thin and fine-grained which results in lower transmissivity even though well yields are comparable. Hydraulic communication between the two formations has been demonstrated within the Great Divide Basin (Mason and Miller, 2005; Lidstone and Wright Environmental Services – Lidstone and Wright, 2013).

As noted in Section 3.2.2.2, the Lance Formation, Lewis Shale, and Mesaverde Formation underlie the Fort Union Formation in the Great Divide Basin. The formations consist of sandstones and shales, and, collectively, these formations are considered part of the Mesaverde Aquifer (Mason and Miller, 2005). Hydraulic conductivities are reported to range from 0.0003 feet per day to 2.2 feet per day (Mason and Miller, 2005). These formations are essentially absent in the Project Area.

The Cody Shale underlies the Fort Union Formation in the western side of the Project Area and is considered a regional aquitard (Whitcomb and Lowry, 1968) and part of the Baxter-Mowry confining unit described by Mason and Miller (2005). Thickness of the shale may range up to several thousand feet. Because of the thickness of the Cody Shale in the Project Area and elsewhere within the Great Divide Basin, deeper formations are not described in this EIS, but descriptions can be found in several references, including Mason and Miller (2005).

Sweetwater River Drainage. To the north of Crooks Gap, the aquifer in the Sweetwater River drainage is the Arikaree aquifer, as defined by Borchert (1977). The aquifer includes saturated rocks of the Oligocene-age White River Formation, Miocene-aged Arikaree Formation, and late Miocene-aged Ogallala Formation (Arikaree and Ogallala formations are considered part of the Split Rock Formation (Love and Christiansen, 1985)). The Arikaree aquifer is a principal groundwater source within eastern Wyoming and northern Colorado and has undergone extensive study in those areas. The Arikaree Aquifer considered in this report is limited to the Sweetwater River Basin, is largely unconfined, and contains potentially large supplies of groundwater. Saturated thickness ranges from 200 to 600 feet and data collected by Borchert (1977) shows groundwater movement toward and parallel to the Sweetwater River and hydraulic connection with the river.

<u>Groundwater Occurrence in the Vicinity of the Project Area</u>

In the vicinity of the Project Area, water-bearing zones are mostly limited to the Battle Spring Formation, but water can also be found in the Fort Union Formation. The formations are often grouped together because they are not well distinguished in the subsurface and groundwater communication often occurs between them (Welder and McGreevy, 1966; Lidstone and Wright, 2013). For the purposes of this assessment, the formations are generally considered as a single aquifer, the Project Area Aquifer. Because of the hydrologic separation between the Great Divide Basin and the Sweetwater River Drainage, in particular the presence of the Cody Shale (see Map 3.2-10 and Figures 3.2-5 and 3.2-6), the Arikaree Aquifer in the Sweetwater River Drainage is outside the area of groundwater influence of the Project. However, because Crooks Creek flows to the aquifer, information is provided on its occurrence in the vicinity of Crooks Gap.

Project Area Aquifer. Groundwater has been studied in the Project Area since the 1970s, as part of previous mining activities. To establish the current conditions prior to the proposed Project, Energy Fuels began collecting additional data in 2010, which is included in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and associated annual reports. Information gathered during these studies included groundwater quality sampling and testing, potentiometric surface mapping, well installation, and pump testing to understand aquifer characteristics (see Map 3.2-12).

The Sheep Mountain Project is located within a groundwater subbasin on the northeastern margin of the Great Divide Basin (see Map 3.2-10). The subbasin is formed by a plunging synclinal fold of Cody Shale, which plunges to the south-southeast at approximately 9 degrees. The deepest portions of the subbasin are filled with over 1,000 feet of the Battle Spring Formation (Lidstone and Wright, 2013). Locally, the Battle Spring Formation may be separated into an upper and lower member (Members A and B, respectively), although the differences may be difficult to distinguish (Stephens, 1964). Where present, the Fort Union Formation may also be several hundred feet thick (Lidstone and Wright, 2013). The Mesaverde Formation may be present at depths of several hundred feet below the Project Area (see Figure 3.2-5). However, because of differences in stratigraphic interpretation, the interval identified as Mesaverde Formation beneath the Project Area may be part of the Cody Shale (Lidstone and Wright, 2013).

Beneath these formations, the Cody Shale sequence of shale and mudstone layers is over 1,000 feet thick in the Sheep Mountain Project Area. Because the Cody Shale is an aquitard, restricting vertical and lateral groundwater flow from the Project Area, the groundwater subbasin is U-shaped, opening to the south-southeast toward the Great Divide Basin (Map 3.2-13). The contact between the Project Area Aquifer and the Cody Shale, which forms the U-shaped boundary of the subbasin, is outlined on Map 3.2-13.

According to Lidstone and Wright (2013), groundwater within the Project Area generally flows from areas of high topography to areas of low topography, resulting in flow towards the west in the northern portion of the Project Area and, farther south, flow towards the southwest into the Great Divide Basin (see Map 3.2-14). Groundwater flow directions similar to topography would be expected for an unconfined aquifer such as the Project Area Aquifer. Aquifer characteristics are comparable to those measured elsewhere in the Great Divide Basin, with some influence noted from the aquifer testing method (Lidstone and Wright, 2013). The recharge to the aquifer is from infiltration of meteoric water, including snowmelt and surface water flow, in the higher elevations of Sheep Mountain.

Groundwater flow rates were calculated to range from approximately 3 feet per year (ft/yr) and 70 ft/yr. Within the Project Area, groundwater movement is affected by naturally occurring and man-made influences. With respect to natural influences, folding and shallow, normal faults are known to occur within the Project Area; however, these features are relatively small-scale and within the Battle Spring and Fort Union formations (Stephens, 1964). Folding and faulting can locally affect groundwater flow, such as elevation differences in adjacent wells; however, at the Project scale, the impacts are minimal. Regional faulting does not extend through the groundwater subbasin in which the Project is located.

Man-made influences on the groundwater flow in the Project Area Aquifer are primarily due to previous mining, including underground mining, open pit mining, and cycles of drawdown and recharge. With respect to underground mining, the historic declines, drifts, and other openings have created significantly increased horizontal and vertical permeability within portions of the Project Area Aquifer, such as the Sheep shafts. However, the extent of the influence of these man-made features is limited to the vicinity of the disturbances, i.e., it does not extend throughout the groundwater basin in which the Project is located. With respect to open pit mining, the evaporative effects at the McIntosh Pit, which intersects the water table, results in steeper hydraulic gradients closer to the pit, forming a slight depression in the water table. The WDEQ-AML reclamation work on the pit should remove the evaporative effects. With respect to cycles of drawdown and recharge, the intermittent mining history at several locations within the Project Aquifer (Section 2.2.2), has resulted in fluctuations in the potentiometric surface in the Project Area. However, the affected portions of the Project Area Aquifer generally recover relatively quickly. For example, during the most recent dewatering of the Sheep underground workings, from 1990 through late 2000, the shafts were pumped at up to 250 gpm. The measured drawdown in the Sheep 1 Shaft was on the order of 1,150 feet (Lidstone and Wright, 2013). Since the dewatering ceased in late 2000, the groundwater level in the Sheep 1 Shaft has recovered to within about 90 percent of the pre-pumping level.

Arikaree Aquifer. The southern margin of the Wind River Basin in the Sweetwater River Drainage is about 1 mile north of the Project Area. The basin deepens quickly to over 1,000 feet deep (Love, 1961 and WSEO, 1974). Near Crooks Gap, the depths to water are reported to be greatest along the edge of the aquifer, ranging from 40 to over 200 feet, and decreasing farther north into the drainage (Borchert, 1987). Hydraulic conductivities for the Arikaree aquifer are reported on the order of 2 to 35 feet per day, with horizontal and vertical conductivities being essentially the same (WSEO, 1974). The permeable, isotropic characteristics of the aquifer would contribute to the loss of Crooks Creek.

Groundwater Quality

The regional water quality within the Great Divide Basin is described first, followed by a description of the water quality in the Sweetwater River Drainage north of Crooks Gap. The groundwater quality in the Project Area is then described.

Regional Groundwater Quality. Within the Great Divide Basin, regardless of the aquifer, the groundwater at shallow depths along the outer portions of the Basin may be suitable for human and livestock use. However, the quality deteriorates toward the center of the Basin and at greater depths where dissolved constituents, such as salts, TDS, and radionunclides concentrate (Mason and Miller, 2005). Naturally occurring constituents, such as trona, nahcolite, shortite, dawsonite, and halite, within subsurface strata; dissolve into the groundwater and degrade water quality in the Basin. Areas of uranium mineralization within the Basin also contribute to poorer water quality in the vicinity of the mineralization. In general, the Tertiary aquifers within the Great Divide Basin are only marginally suitable or unsuitable for domestic and irrigation use, and some shallow aquifers can be suitable for livestock use (Mason and Miller, 2005).

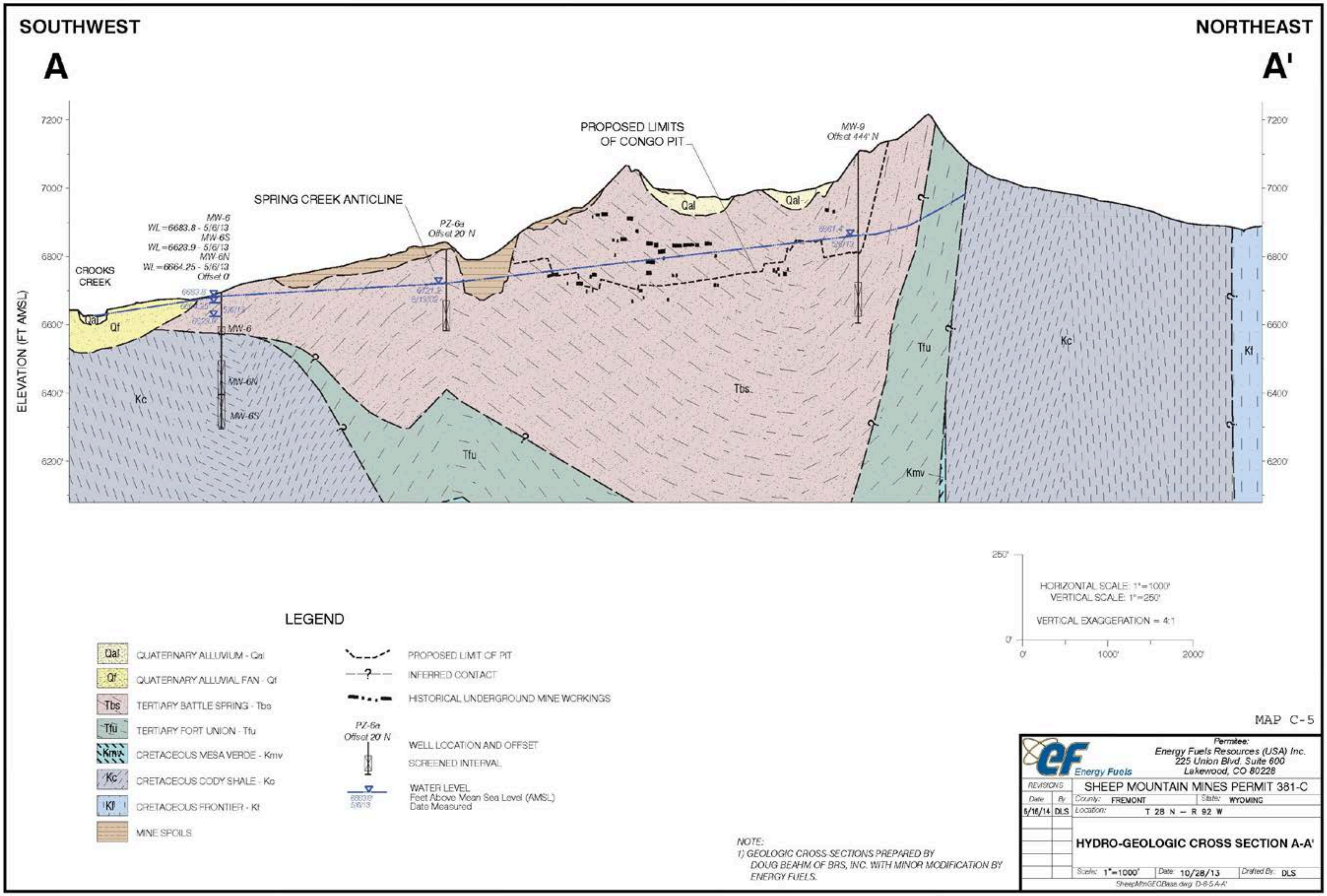


Figure 3.2-5
Hydrogeologic Cross Section A-A'

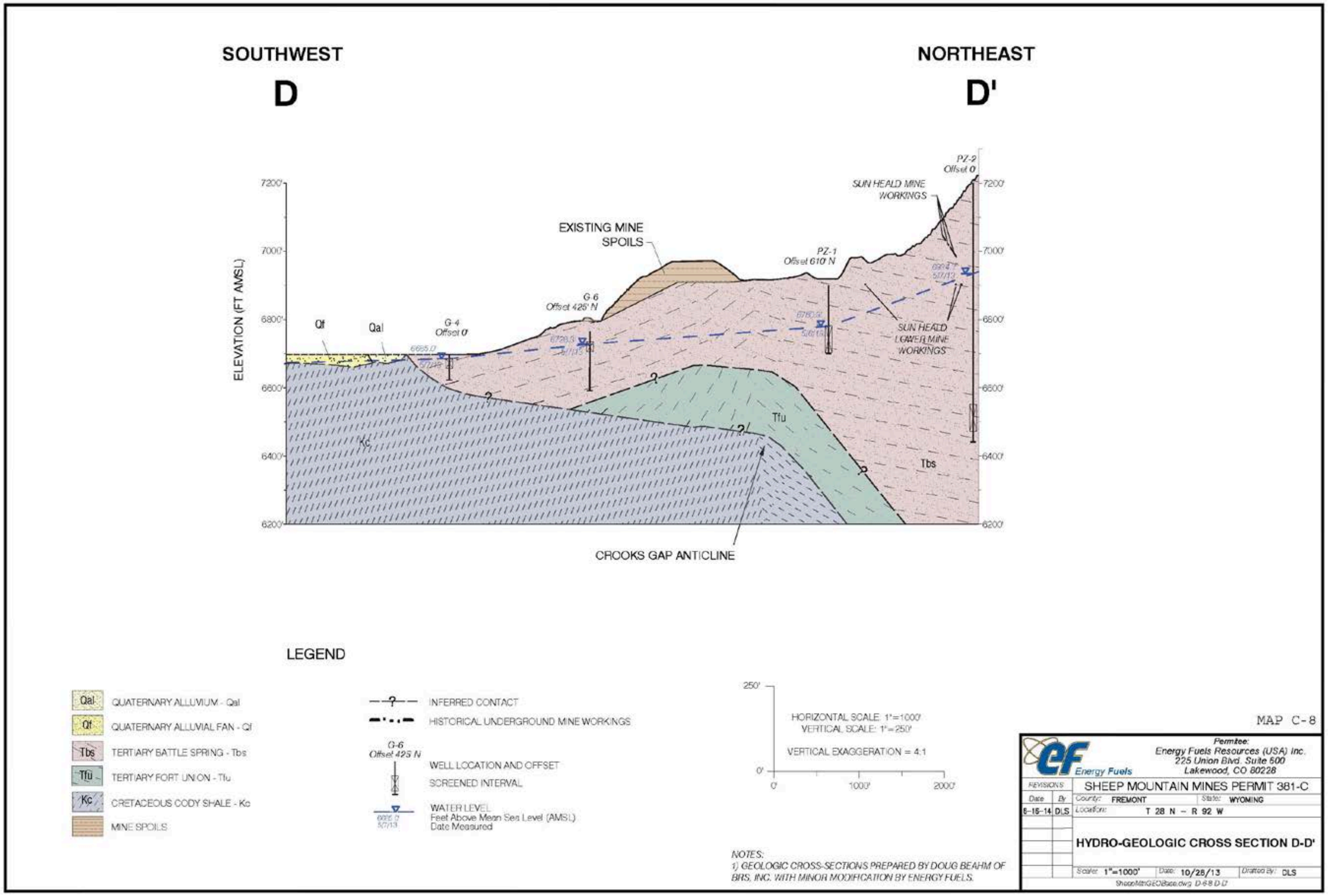
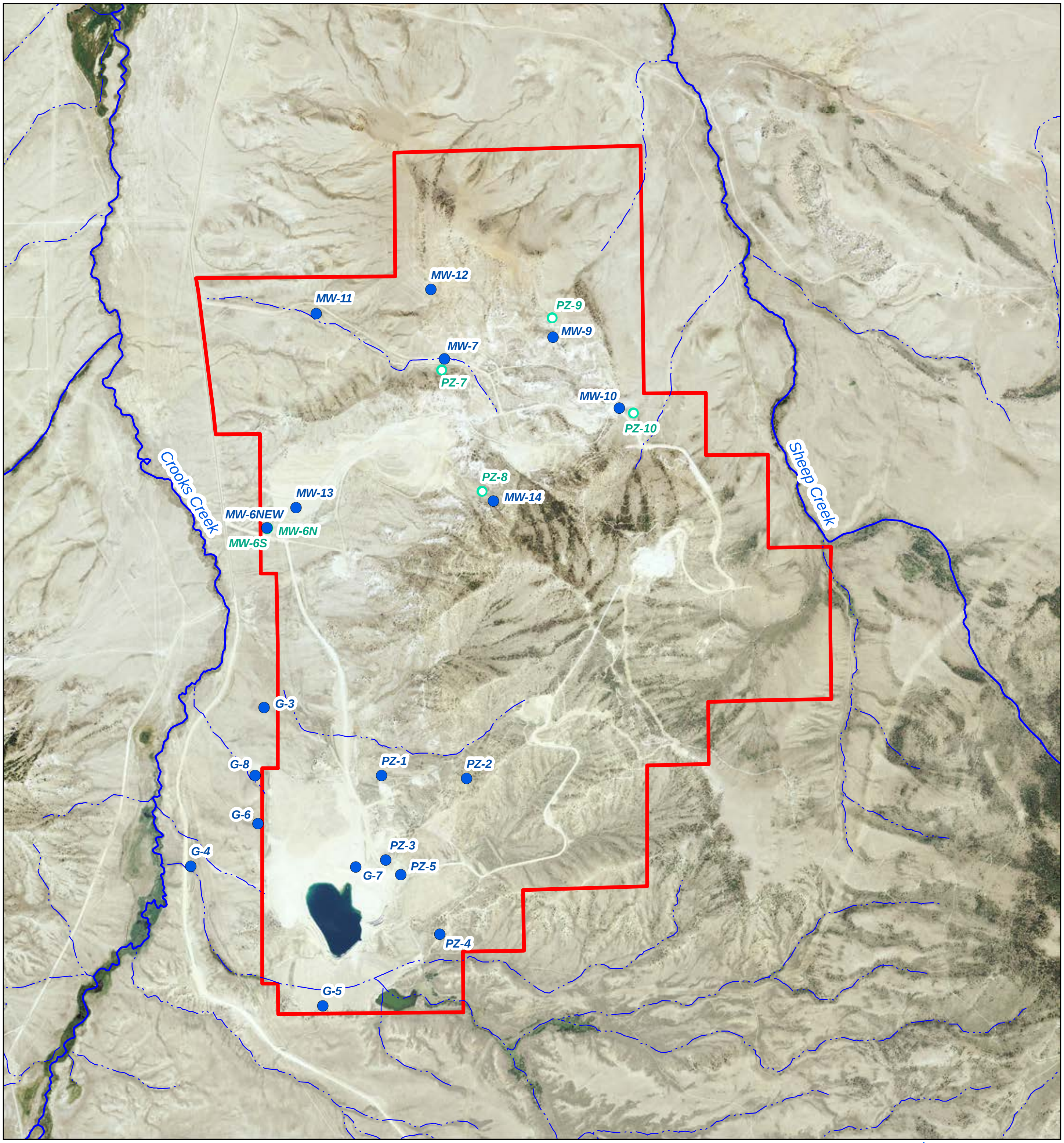


Figure 3.2-6
Hydrogeologic Cross Section D-D'



Map 3.2-12
Groundwater Monitoring Locations

Sheep Mountain Project Area

Groundwater Monitor Wells

Current

Historic

0 4,000
Feet

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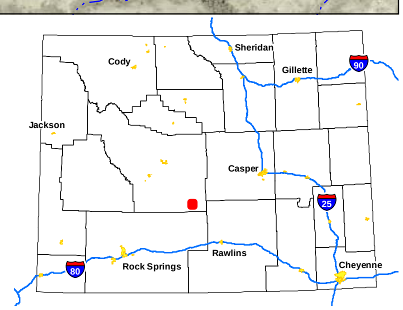

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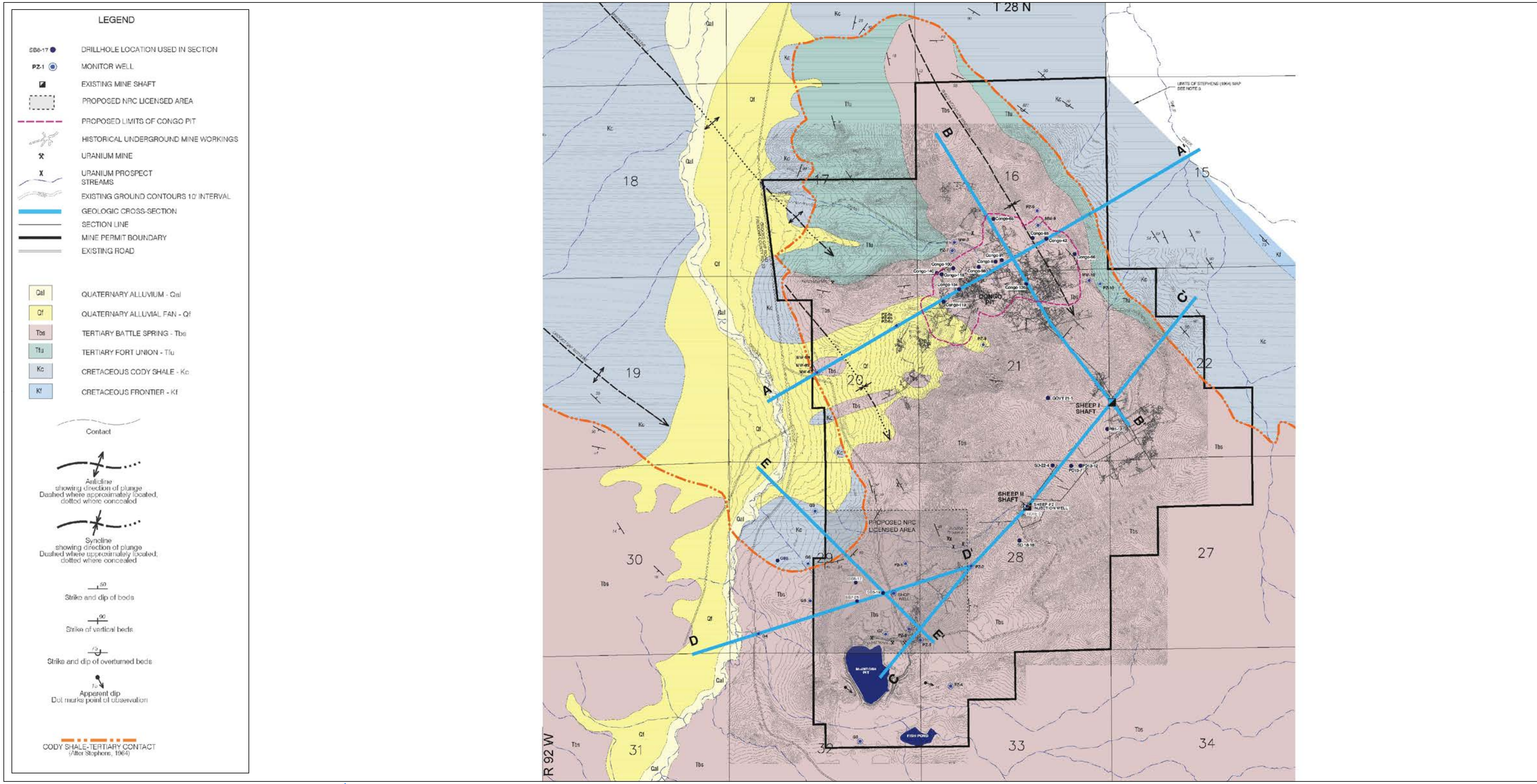

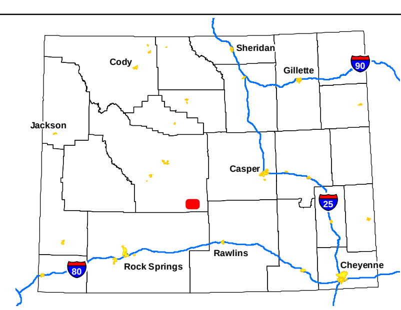

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Map 3.2-13
Hydrogeologic Setting of the Project Area

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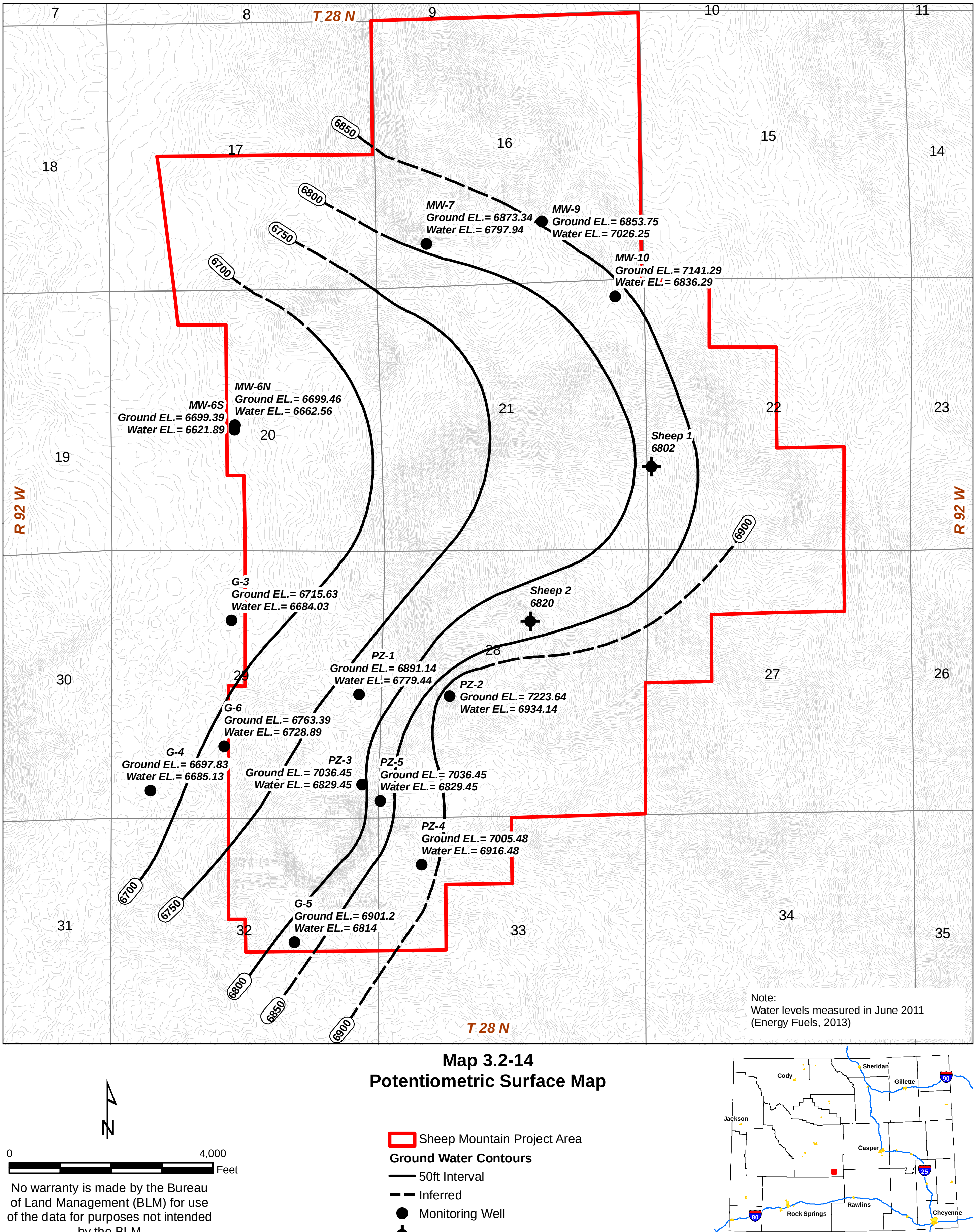

Map 3.2-14
Potentiometric Surface Map

Sheep Mountain Project Area

Ground Water Contours

50ft Interval

Inferred

Monitoring Well

Mine Shaft / Water Elevation

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In the Wasatch Formation, at shallow depths, concentrations of TDS in samples from shallow depths were generally reported to be less than 4,000 mg/l. The dominant cations and anions were mixed, including sodium-bicarbonate and sodium-sulfate water types. Higher TDS concentrations, along with high concentrations of sulfate and elevated sodium adsorption ratios, restrict the uses for which the water is suitable. In samples collected at depths below 500 feet, TDS concentrations were reported to increase substantially to several thousand mg/l, and the water type was generally sodium-chloride (Mason and Miller, 2005).

In the Battle Spring Formation, Collentine et al., (1981) reported TDS concentrations ranging from 150 to 7,200 mg/l in groundwater occurring less than about 1,500 feet below ground surface. The principal water types were reported to be calcium-bicarbonate, sodium-bicarbonate, sodium-sulfate, or some mixture of the three (Mason and Miller, 2005). Groundwater with relatively low concentrations of TDS was reported to contain more sodium-bicarbonate compared to groundwater with higher TDS concentrations (up to 1,000 mg/l) which contained more calcium-sulfate. The difference was considered to be the result of dissolution of gypsum/anhydrite, increasing salinity and enriching calcium and sulfate within the formation (Collentine et al., 1981). Mason and Miller (2005) reported that groundwater within the Battle Spring Aquifer tends to contain high concentrations of radionuclides including: radon-222, uranium, radium-226, radium-228, and gross alpha and beta radiation. Concentrations of radon in several samples were found to exceed the EPA proposed maximum contaminant level (MCL) of 4,000 pCi/l for radon. Based on EPA standards (EPA, 2011a), the water within the Battle Spring Aquifer is generally suitable for irrigation and livestock, and can be suitable for domestic use where radionuclides are not concentrated.

In the Fort Union Formation, groundwater quality is reported as highly variable, but Mason and Miller (2005) found the overall quality in water from shallow wells in the formation to be either suitable for livestock or marginally suitable for domestic use, based on comparison with EPA criteria (2011). Elevated sulfate concentrations and salinity made water from most samples unsuitable for irrigation use. Concentrations of TDS, sulfate, and manganese in many of the samples were found to exceed regulatory criteria such as EPA's SMCLs. Water contained dominant cations of calcium and sodium and dominant anions of bicarbonate and sulfate. Water produced from deeper wells in the Fort Union Formation generally had much poorer quality than water from shallower wells or springs. Production from an average depth of 4,100 feet yielded water with TDS concentrations ranging from 1,170 to 153,000 mg/l (Mason and Miller, 2005).

Similar to the water quality distribution in the shallower formations, groundwater quality in the formations making up the Mesaverde Aquifer is generally of better quality on the margins of the Great Divide Basin, deteriorating with depth toward the Basin center. Collentine et al. (1981) reports TDS concentrations ranging from 500 to over 50,000 mg/l depending on locations within the Basin. Also, similar to changes in water chemistry in the shallower formations in the Basin, the water type changes from sodium-bicarbonate, associated with TDS concentrations less than 1,000 mg/l, to calcium-sulfate, associated with TDS concentrations from 1,000 to 3,000 mg/l. At higher TDS concentrations, sodium-chloride-bicarbonate becomes characteristic, with essentially no sulfate.

Throughout the Sweetwater River Drainage, the groundwater quality in the Arikaree Aquifer is generally considered to be very good with respect to parameters such as TDS and major cations and ions. Even so, the proximity to uranium sources such as the Granite Mountains and mineralization on the north side of Sheep Mountain has resulted in distribution of uranium in the drainage. Uranium concentrations in twenty groundwater samples from the Split Rock Formation, which is part of the aquifer, were reported to average 0.009 mg/l, with generally higher concentrations in four samples collected near Crooks Gap. The reported uranium concentrations in these samples were 0.006, 0.039, 0.044, and 0.050 mg/l (Love, 1961), three of which were in excess of the current EPA MCL of 0.03 mg/l.

Groundwater Quality in the Project Area. Groundwater quality data has been collected from wells in the Project Area since the late 1970s, as part of historic mining activities (Lidstone and Wright, 2013). To determine the current groundwater quality conditions prior to the proposed Project, groundwater samples have been collected since 2010 from 22 locations, including 21 wells and the Sheep I Shaft (see Map 3.2-13). The sampling results are summarized in Table 8 in Appendix 3-B, and the complete results are available in Appendix D-6 of WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

The pH values indicate the groundwater in the Project Area is slightly alkaline, ranging from 7.1 to 8.8, and most of the concentrations of TDS range from about 150 to 790 mg/l in wells in the Project Area Aquifer (Battle Spring and Fort Union formations). The highest concentrations, from 850 to 2,300 mg/l, are in wells completed in the Cody Shale. Concentrations of major cations and anions are generally low within the Project Area Aquifer and do not exceed existing regulatory criteria, with the exception of the chloride concentration in one of the Cody Shale wells. Groundwater quality varies across the site, depending in part on the local lithology. For example, higher sulfate concentrations generally occurred in the same wells with higher uranium concentrations, except in the Cody Shale wells (see Table 8 in Appendix 3-B). Where the Battle Spring Formation is considered predominant, groundwater chemistry is generally characterized as calcium-sodium bicarbonate-sulfate type water. Where the Fort Union Formation is predominant, groundwater contains less calcium and is dominated by sodium-bicarbonate-sulfate type waters. The one anion which, if detected, exceeded any regulatory criteria was ammonia. Although few of the samples exceeded the WDEQ-WQD criteria of 0.5 mg/l for Class I (Domestic), several samples exceeded the groundwater Special (A) Class (Fish and Aquatic) criteria of 0.02 mg/l.

Generally, metal concentrations in Project Area groundwater are reported as non-detect or are detected at concentrations below regulatory criteria. The exceptions were for dissolved aluminum and manganese and for total iron and manganese, which would not be unexpected in this region. Concentrations of these metals exceeded regulatory criteria in several wells. Arsenic, copper, and selenium were generally not detected, although each were detected in two or three different wells and some of the detections exceeded regulatory criteria.

As would be expected in an area of uranium mineralization, concentrations of uranium and radium and measured gross alpha activities are relatively high, compared to WDEQ-WQD and EPA regulatory criteria, in several wells in the Project Area. The highest concentrations appear to be associated with areas of historic mining activity, which would not be unexpected given the likelihood of residual mineralization around these areas (i.e., not all the mineralized material was removed by prior mining). In general, groundwater quality within the Project Area does not meet WDEQ-WQD Class III standards because of elevated radium and gross alpha concentrations (Lidstone and Wright, 2013).

The relatively lower pH values and higher metal concentrations present in some wells are not considered indicative of acid generation and mineral oxidation. No correlations of the parameters generally associated with acid generation and mineral oxidation (e.g., pH, sulfate, iron, manganese, and aluminum) is apparent, and the concentrations of most metals are below laboratory detection limits. With respect to geographic distribution, the pH values in the groundwater samples from the southern portion of the site are generally, but not consistently, lower than those from the northern portion of the property. The pH values in the northern portion of the site, north of Sheep II, range from 7.7 to 8.7, and in the southern portion of the site range from 7.0 to 8.5 with one lower value of 6.5. However, there does not appear to be any other consistent geographic distribution of other parameters. There also do not appear to be any consistent trends in the pH concentrations. The variations in the parameter concentrations are considered indicative of the complex mineralization in the subsurface materials.

The water quality data from the wells completed in the Project Area, which is on the northern edge of the Great Divide Basin, were compared to the limited data available from locations within the basin and within a few miles of the Project Area. The comparison confirms that the data from the Project Area is consistent with the regional water quality characteristics of the shallow aquifers within the basin. For example, the results from the groundwater quality sampling to establish baseline conditions at the Jackpot Mine (see Map 3.2-10) are relatively similar to those collected in the Project Area, exclusive of the areas of prior disturbance. The Jackpot Mine is also located along the margin of the Great Divide Basin, with wells completed in the Battle Spring Formation (BLM, 1995). In contrast, Welder and McGreevy (1966) present the data for a well about 1 mile south of the Project Area, which is reported to be completed in the Wasatch and Battle Spring formations. The reported concentration of TDS, 1,850 mg/l, is elevated compared to the TDS in the Project Area Aquifer, which would be expected moving from the basin margin into the basin. Concentrations of the major cations and anions reported for this well are also consistently higher than those in the Project Area. Uranium concentrations in samples from a variety of sources around Crooks Gap show a similar range as in the Project Area Aquifer. For example, Stephens (1964), in work continued from Denson et al. (1955), reports uranium concentrations from spring and well samples collected in T28N R92W ranging from 0.001 to 0.255 mg/l.

3.2.5.3 Water Rights and Water Use

Surface Water

Information on the surface water rights within the Project Area and within 3 miles of that area was obtained from Wyoming State Engineers Office (WSEO) e-permit database (WSEO, 2013). The surface water rights within the Project Area and within 0.5 miles of that area are listed in Table 1 in Appendix 3-C, and the surface water rights between 0.5 and 3 miles from the Project Area are listed in Table 2 in Appendix 3-C. The locations of the surface water rights listed in the tables are shown on Map 3.2-15.

Along Sheep Creek, four of the seven listed water rights within 0.5 miles of the Project Area are associated with three pipelines that are used by The Union Oil Company of California for drilling operations. The other three listed water rights within 0.5 miles of the Project Area are associated with irrigation ditches. Farther downstream, within 3 miles of the Project Area, there are eight listed water rights associated with irrigation ditches. The listed uses for the surface water rights, which date from the early 1900s, include irrigation (primarily for hay or pasture grass), stock watering, and domestic uses, along with oil and gas operations. Historically, irrigated acreage was limited to a less than 200 acres (WSEO, 1910), but by 1970, no irrigated acreage was reported for Sheep Creek (Hunter et al., 1971) The current surface water uses along Sheep Creek are generally limited to occasional industrial use at the Sheep Creek Oil Field and stock watering.

Along Crooks Creek, six of the fourteen listed water rights within the Project Area were acquired by Energy Fuels, and the water will be put to the uses specified in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). Similar to Sheep Creek, two of the listed water rights within 0.5 mile of the Project Area are used for oil and gas operations. One of the listed water rights is for temporary use by the Fremont County Transportation Department. The other five listed water rights within 0.5 mile of the Project Area and the water rights farther downstream within 3 miles of the Project Area are associated with irrigation ditches or small reservoirs. As in Sheep Creek, the water rights generally date to the early 1900s, and the uses have changed over time. In

1910, no irrigated acres were reported along Crooks Creek (WSEO, 1910), and in 1971, about 500 acres along the entire length of Crooks Creek and its tributaries were reported as irrigated (Hunter et al., 1971). Currently, less than 100 acres are apparently irrigated, including subirrigation for pasture next to the creek and ditches, and most of those acres are at least 3.5 miles downstream of the Project Area.

Non-designated use of waters within the Project Area and in Crooks Creek, Sheep Creek, ponds, and wetlands near the Project Area consist primarily of use by cattle where access to these features can be obtained. Cattle often frequent the Project Area and drink from surface waters within the Western Nuclear Pond, and could reach McIntosh Pit but have never been observed drinking from the pit. Some areas of Crooks Creek have been fenced to keep cattle from accessing the wetlands, but in general cattle and wildlife can access Crooks Creek when it is not frozen or during the summer months when the creek has enough water for drinking.

Groundwater

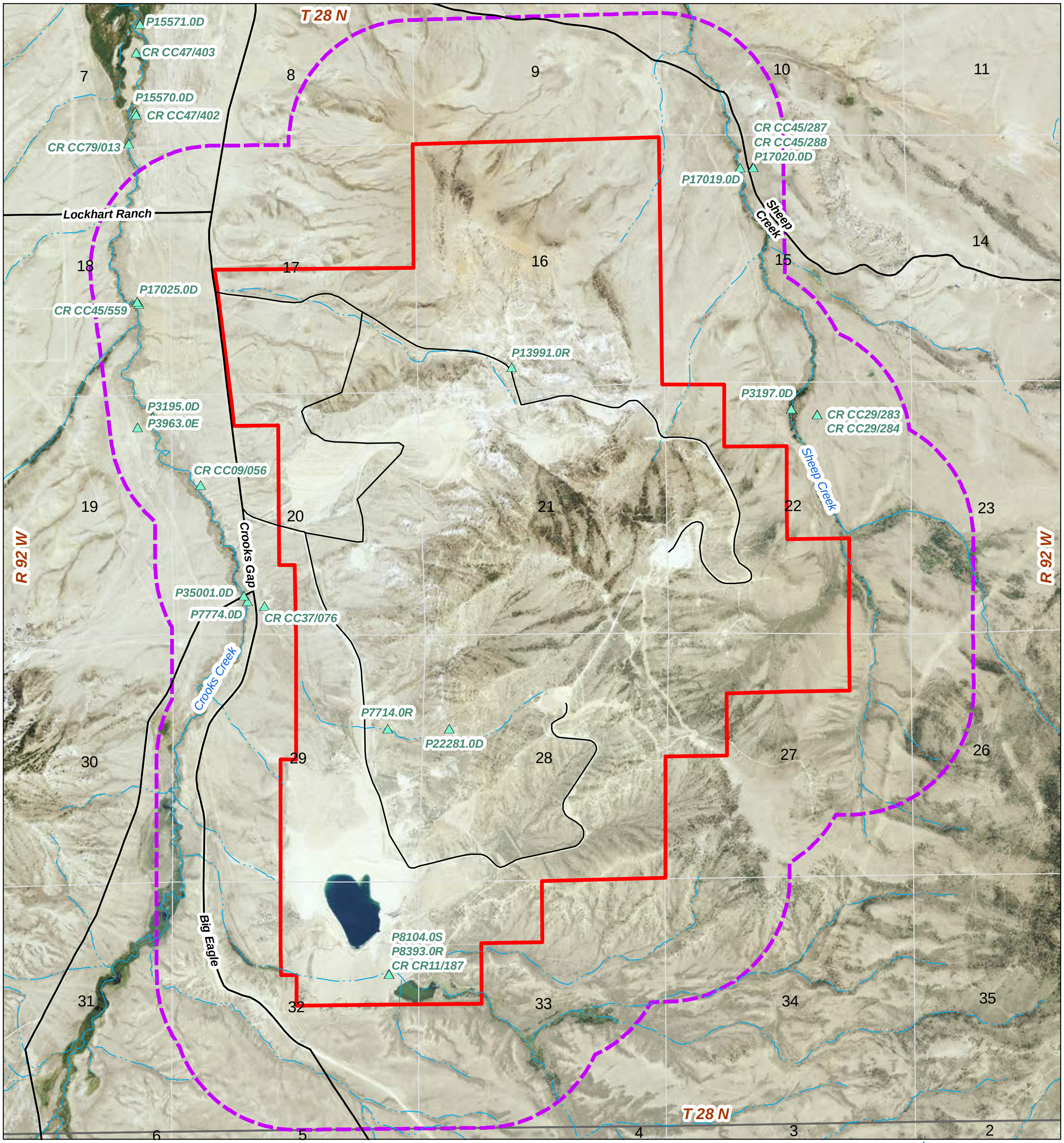
Information on the groundwater rights within the Project Area and within 3 miles of that area was obtained from the WSEO e-permit database (WSEO, 2013). This information is listed in Table 3 in Appendix 3-C, and the locations are shown on Map 3.2-16.

According to the WSEO database (WSEO, 2013), there are 30 groundwater permits within the Project Area. All the water rights within the Project Area were acquired by Energy Fuels, and the water will be put to the uses specified in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

Outside the Project Area, no permitted water wells within 2 miles of the Project Area are being put to beneficial use (WDEQ, 2015a). The WSEO database lists six water rights associated with the Big Eagle Mine, which is about 2 miles to the east-southeast of the Project Area and is in reclamation. The database also lists six water rights associated with the Jackpot Mine (Green Mountain Mining Venture), which is about 3 miles east of the Project Area and is also in reclamation. To the north of Crooks Gap, the database lists five water rights. The closest permanent residence is the Claytor Ranch, which is about 3.5 miles north of the Project Area. The groundwater north of the Gap is generally separated from the Project Area by the Cody Shale.

Under the EPA's Source Water Assessment Program (SWAP), groundwater in the Project Area is mapped as Zone 3. Zone 3 includes watersheds upgradient of an aquifer which could fall within the capture zone of a public water supply well. According to SWAP data, the nearest public source of drinking water is 3.5 miles to the southeast of the Project Area. This location consists of one water well, several potential creek-water capture zones, and one reservoir (A&M Reservoir) used for public consumption along the Continental Divide Trail (BLM, 2010). The reservoir is on an unnamed drainage which flows to the west into the Great Divide Basin and is artificially supplied by a Merit Energy Company well and a BLM well (WGFD, 2004). If well water were not pumped to the reservoir, it would be dry. The location is well outside the area of influence of the Project (see Map 3.2-10).

The next closest public source of drinking water is located in Jeffrey City approximately 5.8 miles north of the Project Area (Map 3.2-10), and is part of the Jeffrey City Water and Sewer District (Public Water Source Permit: PWS #56000106). The attenuation zone for the Jeffrey City municipal well (SWAP Zone 2 area) is 5.75 miles from the Project Area. The Jeffrey City well is completed in the Arikaree Aquifer (609 Consulting, LLC, 2013) in the Sweetwater River Drainage. This aquifer is on the opposite side of Crooks Gap from the Project Area and is also generally separated from the Project Area by the effective aquitard of the Cody Shale.



Map 3.2-15
Surface Water Rights within the Project Area and within 0.5 Mile Downstream of the Project Area

Sheep Mountain Project Area
1/2-mile Project Buffer
Surface Water Right

N

0 3,000 Feet

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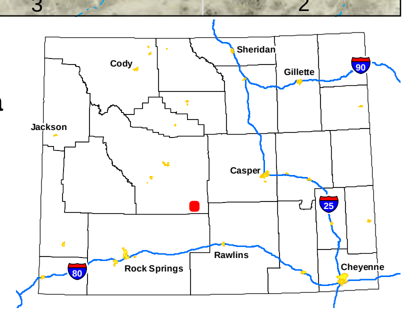

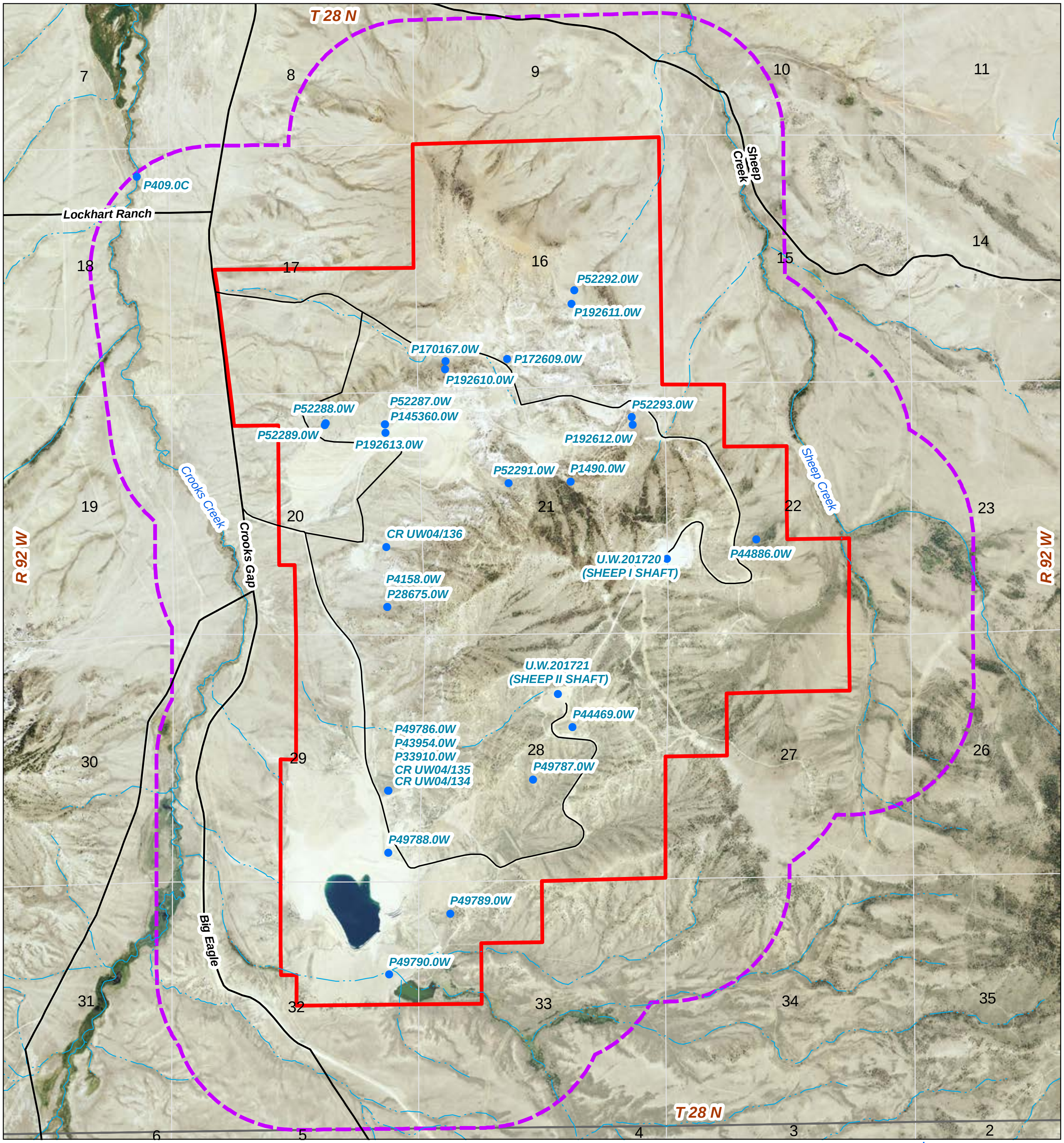

Map 3.2-16
Groundwater Rights within the Project Area and within 0.5 Mile of the Project Area

- Sheep Mountain Project Area
- 1/2-mile Project Buffer
- Groundwater Right

0 3,000 Feet

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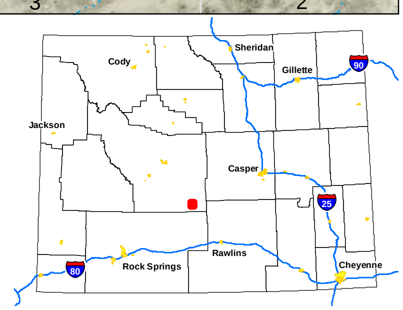


3.3 BIOLOGICAL RESOURCES

3.3.1 Invasive, Non-Native Species

The State of Wyoming lists 25 plants as designated noxious weeds that the Wyoming Weed and Pest Council and Wyoming Board of Agriculture have found to be detrimental, destructive, injurious, or poisonous and should be controlled within the State of Wyoming. Fremont County Weed and Pest is responsible for implementing and pursuing an effective program for the control of designated weeds (Wyoming Weed and Pest Control, 2011). Fremont County has established three weed management areas in which the county enters into cooperative agreements with landowners and public land management agencies to facilitate, promote, and coordinate wide scale integrated weed and pest management. Fremont County Weed and Pest Control District (WPCD) also identifies 11 “weeds of concern” that are non-native species and can be invasive under the right conditions (Fremont County, 2011), and should be controlled if documented.

The BLM LFO contracts annually with the Fremont WPCD for control (i.e., inventory, spraying, releasing insect vectors, and monitoring) of weeds on BLM-administered lands. This is done as a cooperative effort with private landowners who are engaged in weed control programs on their own lands. Without these precautionary actions, untreated federal lands could serve as a seed source of weeds for invading private lands that have weed control programs.

The Project Area lies within the Popo Agie Weed Management Area (PAWMA), the boundaries of which correspond to those of the Popo Agie Conservation District, which in this area is the county line. The PAWMA is a group of local, state, and federal agencies that work through a Memorandum of Understanding (MOU) with the Fremont County WPCD to assist the landowners in the area with controlling noxious weeds.

No noxious weeds were sighted within the study area during the 1980 reconnaissance surveys. During pedestrian reconnaissance surveys in 2010, one state designated weed, Canada thistle (*Cirsium arvense*), and one county designated weed, bull thistle (*Cirsium vulgare*) were noted within the Project Area. Bull thistle was documented on the reclaimed land south of the Congo Pit within the affected area and Canada thistle was located on a historical mine exploration road west of Sheep II Shaft, outside of the affected area, but within the Project Area (BKS, 2011b). Russian olive (*Elaeagnus angustifolia*), spotted knapweed (*Centaurea maculosa*), musk thistle (*Carduus nutans*), and black henbane (*Hyoscyamus niger*) have been documented in or within a 1-mile radius of the Project Area. Table 3.3-1 identifies the 25 Wyoming designated weeds, as well as the 11 weeds of concern identified by Fremont County.

Table 3.3-1
State of Wyoming Designated Noxious Weeds and Fremont County Weeds of Concern

Common Name/ Scientific Name	Characteristics	Distribution/Location in Relation to the Proposed Action
State of Wyoming Designated Weeds		
Canada Thistle *Cirsium arvense*	Initially establishes itself in disturbed soils; reproduces by seed and creeping rootstock.	Documented within the Project Area; along Crooks Gap/Wamsutter Road, Crooks Creek within 0.5 mile of Project Area.
Common Burdock *Arctium minus*	Commonly found growing along roadsides, ditch banks, in pastures and waste areas; reproduces by seed.	Located >20 miles from Project Area.
Common St. Johnswort *Hypericum perforatum*	Frequently found on sandy or gravelly soils; reproduce by seed or short runners.	Not known in Fremont County.
Common Tansy *Tanacetum vulgare*	Found along roadsides, waste areas, stream banks, and in pastures; reproduces from seed and rootstalks.	Located >20 miles from Project Area.
Dalmation Toadflax *Linaria dalmatica*	Found along roadsides and on rangeland; reproduces by seed and underground rootstalks.	Located >20 miles from Project Area.
Diffuse Knapweed *Centaurea diffusa*	Occurs along roadsides, waste areas, and dry rangelands and dominates disturbed areas; reproduces by seed.	Known populations located within the Cooper Creek and Willow Creek drainages; slopes of Green Mountain.
Dyers Woad *Isatis tinctoria*	Occurs along roadsides and disturbed sites and spreads from there to rangeland and cropland by seeds.	Not known in Fremont County.
Field Bindweed *Convolvulus arvensis*	Occurs in cultivated fields and waste places; reproduces by seeds and root stalks.	Known populations located outside of the former Green Mountain Common Allotment (GMCA), Sweetwater Station.
Hoary Cress (Whitetop) *Cardaria draba (C. pubescens)*	Prevalent in areas with alkaline or disturbed soils; reproduces from seed and rood segments.	Known populations located within 5 miles of Project Area, along the Sweetwater River and US Highway 287.
Houndstongue *Cynoglossum officinale*	Found in pastures, along roadsides, and in disturbed habitats; reproduces by seed.	Located >20 miles from Project Area.
Leafy Spurge *Euphorbia esula*	Grows in nearly all soil types and habitats; reproduces by seed and rootstalks.	Known populations located within 15 miles of Project Area, along western portions of the former GMCA.
Musk Thistle *Carduus nutans*	Invades pastures, range and forest lands, roadsides, waste areas, ditch banks, stream banks, and grain fields; reproduces rapidly by seed.	Known populations located along Crooks Creek outside of the Project Area.
Ox-eye Daisy *Chrysanthemum leucanthemum*	Found in meadows, roadsides, and waste places; reproduces by seed.	One population observed in Project Area.
Perennial Pepperweed (giant whitetop) *Lepidium latifolium*	Occurs in riparian areas, waste areas, ditches, roadsides, croplands, range and meadows, and disturbed areas; reproduces by seed and deep-seated rootstalks.	Known populations located along the Sweetwater River outside of the former GMCA.
Perennial Sowthistle *Sonchus arvensis*	Common in gardens, cultivated crops, ditch banks, and fertile waste areas; reproduces by seed and creeping roots.	Located >20 miles from Project Area.
Plumeless Thistle *Carduus acanthoides*	Occurs in pastures, stream valleys, fields, and roadsides; reproduces by seed.	Not known in Fremont County.
Purple Loosestrife *Lythrum salicaria*	Infest moist, marshy or wet areas such as canals, ditches, or lake edges; reproduce by seed.	Not known in Fremont County.
Quackgrass *Agropyron repens*	Occurs in croplands, pastures, rangeland, and roadsides; reproduces by seed or spreading by rhizomes.	Known populations located along the Sweetwater River outside of the NW boundary of the former GMCA.
Russian Knapweed *Centaurea repens*	Occurs in a variety of habitats and forms colonies in cultivated fields, orchards, pastures, and roadsides; reproduces by seeds and creeping rootstocks.	Known populations in western GMCA along Bison Basin Road, at Picket and Daley Lake, along Sweetwater River outside the former GMCA.

Common Name/ Scientific Name	Characteristics	Distribution/Location in Relation to the Proposed Action
Russian Olive *Elaeagnus angustifolia*	Invade low-lying pastures, meadows, or waterways; reproduces by seed.	Common in Fremont County; treated with the Project Area on a previous mine disturbance.
Saltcedar (Tamarisk) *Tamarix* spp.	Invades wetlands, moist ranges, lake sides, stream banks, sandbars, and other saline environments; reproduces by seed.	Known populations located within 15 miles of Project Area, near Sweetwater Station and Lost Creek Reservoir in the Great Divide Basin.
Scotch Thistle *Onopordum acanthium*	Found along waste areas and roadsides; very aggressive; reproduces by seed.	Known populations located within 15 miles of the Project Area.
Skeleton Bursage *Franseria discolor*	Aggressive growth habits; spread mainly by creeping roots.	Not known in Fremont County.
Spotted Knapweed *Centaurea maculosa*	Establish in disturbed soils; very aggressive; reproduces by seed.	Known populations located on Crooks Creek adjacent to the Project Area.
Yellow Toadflax *Linaria vulgaris*	Occurs in rangelands, along roadsides, waste places, and cultivated fields; reproduces by seed and creeping roots.	Located >20 miles from Project Area.
Fremont County Weeds of Concern		
Absinth Wormword *Artemisia absinthium*	Flowers from late July through August	Not known in Fremont County.
Black Henbane *Hyoscyamus niger*	Common in pastures, along fencerows, along roadsides, and waste areas.	Known populations located within 5 miles of Project Area along the Crooks Gap/Wamsutter Road.
Bull Thistle *Cirsium vulgare*	Occurs in pastures, roadsides, and disturbed sites; reproduces by seed.	Documented within the Project Area; other known populations located > 20 miles of Project Area.
Common Mullein *Scrophulariaceae*	Common along river bottoms, pastures, meadows, fence rows, and waste areas, especially on gravelly soils; reproduces by seed.	Known populations located within 10 miles of Project Area.
Japanese Knotweed *Polygonum cuspidatum*	Occurs in roadsides, waste areas, ditch banks, and pastures; reproduces by creeping rhizomes.	Located >20 miles from Project Area.
Marsh Sowthistle *Sonchus arvensis*	Occurs along roadsides, fields, and disturbed areas; spread by seed and extensive roots.	Located >20 miles from Project Area.
Puncturevine *Tribulus terrestris*	Grows in pastures, cultivated fields, waste areas, and along highways and roads; reproduces by seed.	Located >20 miles from Project Area.
Russian Thistle *Salsola iberica*	Found in disturbed wastelands, over-grazed rangeland, and irrigated and dryland ag; reproduces by seed.	Not known in Fremont County.
Sulphur Cinquefoil *Potentilla recta*	Found in disturbed areas such as roadsides and pastures; colonies are also often seen in undisturbed sites; flowers from May to July.	Located >20 miles from Project Area.
Swainsonpea *Sphaerophysa salsula*	Commonly found along roadsides and fences; reproduces by seed and lateral roots.	Known populations located within 5 miles of Project Area.
Wild Licorice *Glycyrrhiza lepidota*	Commonly found in moist, sandy soils of meadows, pastures, prairies, ditches and river banks, and waste areas; reproduces from deep roots and seed.	Known populations located within 10 miles of Project Area.
Under Review for Fremont County		
Cheatgrass *Bromus tectorum*	Cheatgrass is an invasive annual grass. Fire frequency is increased with cheatgrass invasion; the establishment of cheatgrass causes substantial competition for resources used by native shrubsteppe species.	Present in the Project Area.
Baby's Breath *Glypsophila paniculata*	An ornamental species that has escaped cultivation; can form dense stands competing with forage species and is difficult to control.	Populations within 10 miles of Project Area.
Sources: Fremont County, 2011; Fremont County, 2004b; BKS, 2014b; Cohen, 2015.		

3.3.2 Vegetation

Elevations in the Project Area range from about 6,600 in the northwest corner to 7,835 feet at the top of Sheep Mountain. Vegetation types within the Project Area appear to be directly related to the geographic and topographic locations of soils, soil depths, slope, aspect, and elevation.

The Project would be located within an area defined by the NRCS as Major Land Resource Area (MLRA) 34A – Cool Central Desertic Basins and Plateaus (USDA, 2006). MLRA 34A contains a semi-desert grass-shrub zone, the largest zone within the MLRA, is characterized by a vast sagebrush steppe within central and southern Wyoming and extending into northwestern Colorado. This zone occurs in the areas receiving 8 to 16 inches of annual precipitation. The representative vegetation includes Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), antelope bitterbrush (*Purshia tridentata*), western wheatgrass (*Pascopyrum smithii*), bluebunch wheatgrass (*Pseudoroegneria spicata*), needle-and-thread (*Hesperostipa comata*), prairie junegrass (*Koeleria macrantha*), and Indian ricegrass (*Achnatherum hymenoides*). Utah juniper (*Juniperus osteosperma*) may occur in small areas. Cottonwood (*Populus* spp.) and willows (*Salix* spp.) grow in riparian zones along the major perennial streams and rivers (USDA, 2006).

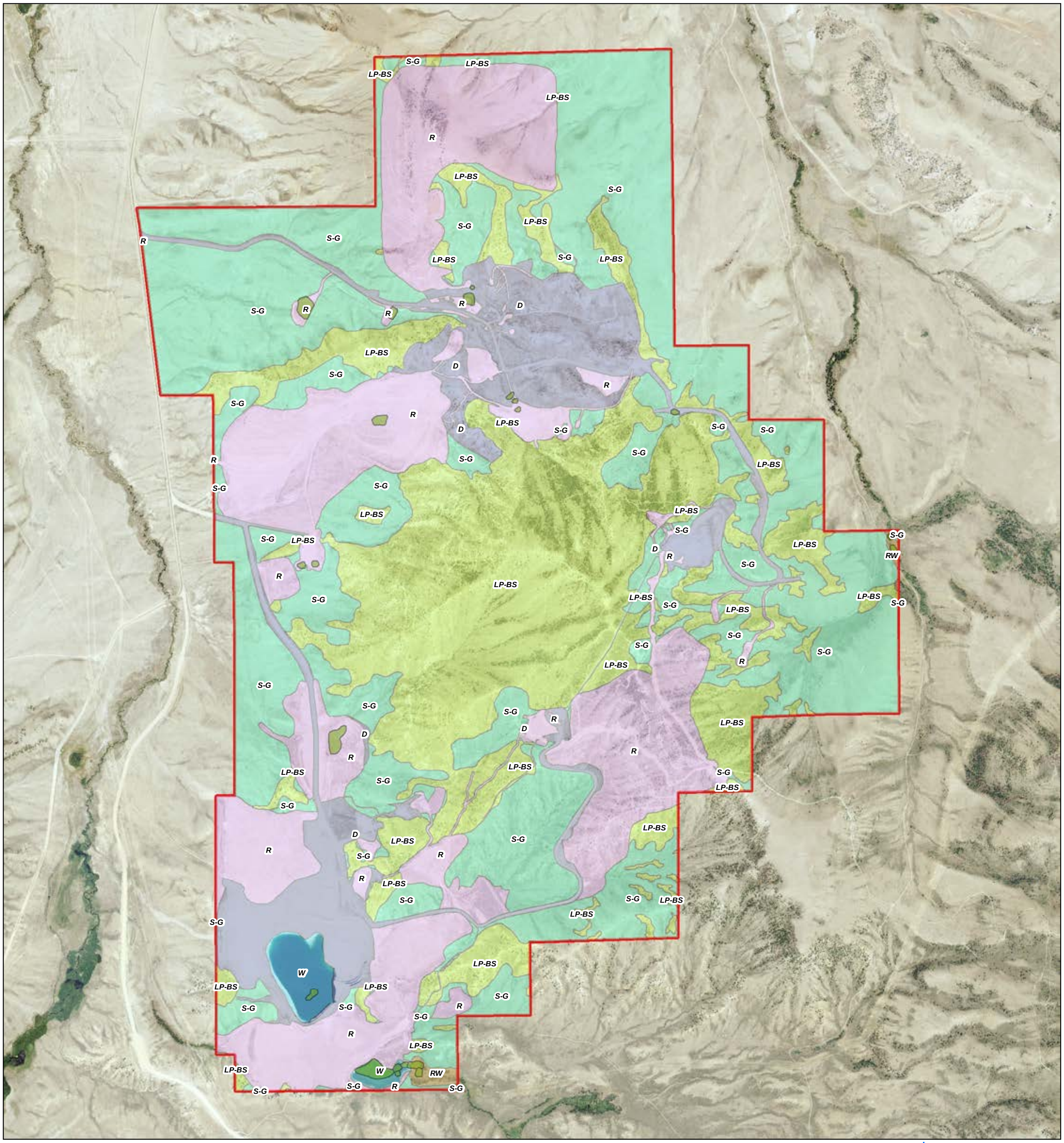
With the portion of MLRA 34A that coincides with the Project Area, there are eight ecological sites that are based on rangeland and forestland soils and vegetation within specified regions and annual precipitation zones. Land units described as an ecological site (ESD) share similar capabilities to respond to management activities or disturbance (USDA, 2006). Among other information, ESDs provide vegetation and surface soil properties of reference conditions that represent either 1) pre-European vegetation and historical range of variation in the United States, or 2) proper functioning condition or potential natural vegetation (USDA, 2003). The following are the ESDs provided by the NRCS for the Project Area:

- <u>Loamy - 15 to 19 inch Foothills and Mountains East Precipitation Zone</u>: This site type typically occurs on gently undulating rolling land and steeper slopes, located primarily on all aspects of Sheep Mountain in steep terrain, covering a total of 631.31 acres. The current vegetation community is composed of approximately 33 percent graminoids (grasses or grass-like plants), 9 percent forbs, and 58 percent shrubs.
- <u>Coarse Upland - 15 to 19 inch Foothills and Mountains Southeast Precipitation Zone</u>: These sites typically occur in the uplands on terraces and are located primarily on the ridge top and west aspect of Sheep Mountain covering a total of 464.40 acres. The current vegetation community is composed of approximately 33 percent graminoids, 9 percent forbs, and 58 percent shrubs.
- <u>Shallow Loamy - 10 to 14 inch East Precipitation Zone</u>: These sites typically occur on steep slopes and ridgetops and are located primarily in the northern part of the Project Area on all aspects and on the west aspect of Sheep Mountain, covering a total of 537.85 acres. The current vegetation community is composed of approximately 30 percent graminoids, 5 percent forbs, and 65 percent shrubs.
- <u>Coarse Upland - 10 to14 inches East Precipitation Zone</u>: These sites typically occur on undulating rolling land. They are located primarily on the east aspect of Sheep Mountain, covering a total of 115.51 acres. The current vegetation community is composed of approximately 30 percent graminoids, 5 percent forbs, and 65 percent shrubs.
- <u>Sandy - 10 to 14 inches High Plains Southeast Precipitation Zone:</u> These sites typically occur in an upland position on relatively flat to moderately sloping land. They are located primarily on the western and northeastern boarder of the Project Area covering a total of 445.94 acres. The current vegetation community is composed of approximately 29 percent grasses or grass-like plants, 8 percent forbs, and 63 percent shrubs.

- Coarse Upland - 10 to14 inches High Plains Southeast Precipitation Zone: These sites typically occur in an upland position on gentle slopes. They are located primarily on the west and east aspect of Sheep Mountain covering a total of 363.61 acres. The current vegetation community is composed of approximately 33 percent graminoids, 9 percent forbs, and 58 percent shrubs.
- Shallow Loamy - 10 to14 inches High Plains Southeast Precipitation Zone: These sites typically occur in an upland position. They are located primarily on the west aspect of Sheep Mountain covering a total of 256.17 acres. The current vegetation community is composed of approximately 28 percent graminoids, 11 percent forbs, and 61 percent shrubs.
- Loamy – 10 to 14 inches High Plains Southeast Precipitation Zone: This site type occurs on the lower eastern slope of Sheep Mountain covering a total of 35.01 acres. Potential vegetation on sites consists of 80 percent graminoids, 10 percent forbs, and 10 percent woody shrubs.
- Shallow Sandy – 10 to14 inches High Plains Southeast Precipitation Zone: This site type is present at one location within the Project Area covering a total of 17.51 acres. Potential vegetation on sites consists of 70 percent graminoids, 10 percent forbs, and 20 percent woody shrubs.
- Loamy Overflow – 10 to14 inches High Plains Southeast Precipitation Zone: These sites typically occur on gently sloping to moderately sloping canyon and a small valley bottom. They are located only on the east aspect of Sheep Mountain covering a total of 54.60 acres. The current vegetation community is composed of approximately 33 percent graminoids, 9 percent forbs, and 58 percent shrubs.
- Wetland – 10 to14 inches High Plains Southeast Precipitation Zone: This site is present at one location covering 11.87 acres which is associated with Western Nuclear Pond in the extreme south of the Project Area. Potential vegetation on wetland sites consists of 80 percent graminoids, 10 percent forbs, and 10 percent woody shrubs.

The NRCS also described “Dumps, Mine” as an ecological site with areas of waste rock derived mainly from former mining including uranium mines and quarries covering 1,267 acres (see Section 3.2.4.2 under Soils, above). The former mine sites are located throughout the entire Project Area and are typically devoid of vegetation with limited reclamation success and potential.

Vegetation communities within the Project Area were described and sampled in 1980 following guidance provided by the WDEQ-LQD, in Guideline No. 6 (Noncoal; Application for a “Permit to Mine” or an “Amendment” – WDEQ, 2003) and Guideline No. 2 (Vegetation – WDEQ, 1997). Two principal vegetation type communities and one minor vegetation type were identified within the Project Area during field surveys completed in 1980 and 1981 (BKS, 2014b). Sagebrush-Grass type dominates the vegetation community, covering 1,331 acres (37 percent) of the Project Area shown on Map 3.3-1. The Limber Pine-Big Sagebrush type community covers 967 acres (27 percent of the Project Area). A minor amount of Quaking Aspen-Grass Forb type (riparian woodland type) is associated with a riparian zone in the southeast corner occupying 0.3 percent of the Project Area. Open water covers 39 acres or 1.1 percent of the Project Area. Approximately 880 acres (24 percent of the area) disturbed by earlier mining were mapped reclaimed while 387 acres (11 percent) were mapped as disturbed ground surface.



Map 3.3-1
Vegetation in Relation to the Project Area

Sheep Mountain Project Area

Vegetation

- D: Disturbed
- LP-BS: Limber Pine-Big Sagebrush
- Reclaimed
- Riparian Woodland
- S-G: Sagebrush-Grass
- Water
- NWI Wetlands

Data provided by BKS Environmental Associates, Inc. (9-3-2014)

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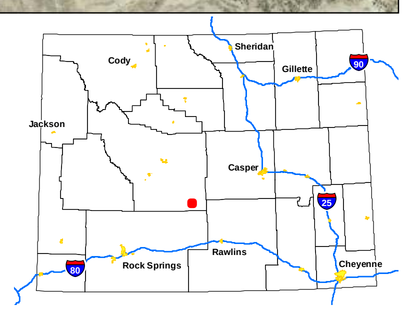
No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM



The Sagebrush-Grass vegetation type occurs at lower elevations within the Project Area predominantly on flat to moderately-sloping concave fans of sandstone derived alluvium. Dominant species include: Wyoming big sagebrush, black sagebrush (*Artemisia nova*), rubber rabbitbrush (*Ericameria nauseosa*, formerly *Chrysothamnus nauseosus*), and Douglas rabbitbrush (*Chrysothamnus viscidiflorus*). In areas of native habitat, Wyoming big sagebrush and black sagebrush are 12 to 24 inches tall, ranging from 20 to 45 percent foliar cover. Common understory species include Sandberg bluegrass (*Poa secunda*), western wheatgrass, bluebunch wheatgrass, needle-and-thread, penstemon (*Penstemon* spp.), Hood's phlox (*Phlox hoodii*), common yarrow (*Achillea millefolium*), spring parsley (*Cymopterus acaulis*), and scarlet globemallow (*Sphaeralcea coccinea*).

At higher elevations with higher annual moisture regimes, mountain big sagebrush/mountain shrub-grasslands occurs in more productive, deeper soil sites adjacent to the Limber Pine-Big Sagebrush vegetation type. Mountain sagebrush (*Artemisia tridentata vaseyana*) and mixed mountain shrubs are 24 to 48 inches tall and range from 30 to 50 percent foliar cover. In addition to mountain big sagebrush, these areas also include a mixture of serviceberry (*Amelanchier alnifolia*), antelope bitterbrush, rabbitbrush, snowberry (*Symphoricarpos albus*), and currant (*Ribes* spp.). The understory includes common species such as western wheatgrass, bluebunch wheatgrass, Idaho fescue (*Festuca idahoensis*), kingspike fescue (*Leucopoa kingii*), Columbia needlegrass (*Achnatherum nelsonii*), penstemon (*Penstemon* spp.), Hood's phlox, common yarrow, spring parsley, arrowleaf balsamroot (*Balsamorhiza sagittata)*, shooting star (*Dodecatheon meadia*), Indian paintbrush (*Castilleja linariifolia*), wild buckwheat (*Eriogonum* spp.), and stonecrop (*Sedum* spp.).

Average vegetative cover for the Sagebrush-Grass vegetation type within the Project Area is approximately 37 percent. Litter and rock average between 25 and 37 percent, and bare ground covered between 26 and 38 percent. Annual production during the 1980 survey averaged 464 pounds per acre on the proposed affected mine area. Shrubs made up 20 percent of total ground cover, grasses made up 9 percent, perennial forbs range between 4 and 5 percent, and grasslike species made up 3 percent. Shrub heights ranged from 2 to 69 centimeters (cm) with an average of 21 cm. Heights of big sagebrush averaged 18 cm, rubber rabbitbrush averaged 33 cm, and Douglas rabbitbrush averaged 17 cm.

The Limber Pine-Mountain Big Sagebrush vegetation type occurs along ridge tops and steeper slopes in shallow to very shallow soils interspersed with rock outcrops and boulder wash. Dominant species include limber pine (*Pinus flexilis*), mountain big sagebrush, black sagebrush, Douglas rabbitbrush, and antelope bitterbrush. Less abundant shrubs include silver sagebrush (*Artemisa cana*), snowberry, and currant. The understory supports a mix of grasses and forbs including western wheatgrass, bluebunch wheatgrass, Idaho fescue, kingspike fescue, penstemon, Hood's phlox, common yarrow, spring parsley, arrowleaf balsamroot, shooting star, Indian paintbrush, wild buckwheat, and stonecrop.

Total vegetative cover within the Project Area is approximately 43 percent. Litter and rock averaged between 30 and 35 percent, and bare ground represents between 25 percent and 27 percent. Annual production measured during the 1980 survey averaged 5,801 pounds per acre on the Project Area. Shrubs made up 25 percent of the total ground cover, grasses made up 12 percent, perennial forbs made up 5 percent, grasslikes, half-shrubs, and succulents made up less than 1 percent vegetative cover in the Project Area. Rose pussytoes and hooker sandwort are the most common perennial forbs. Big sagebrush is the most abundant shrub. Limber pine and Utah Juniper (*Juniperus osteosperma*) are the two tree species present. Shrub heights ranged from 5 to 97 cm with an average height of 29 cm. Big sagebrush averaged 34 cm, black sagebrush averaged 16 cm, antelope bitterbrush averaged 23 cm, and snowberry (*Symphoricarpos* spp.) averaged 19 cm in height.

In June 2011, Limber Pine-Big Sagebrush areas were sampled using the point center quarter method (BKS, 2011b and 2014b). Limber pine had an approximate density of 17.89 trees per acre, while the Utah juniper had approximately 1.90 trees per acre. Limber pine occurrence within the Project Area is discussed in greater detail in Section 3.3.4.3, below.

The expected potential composition for this area generally ranges from 75 to 80 percent grasses, 10 percent forbs, and 10 to 15 percent woody plants. Mid cool-season perennial bunch grasses generally dominate this site, such as western wheatgrass, bluebunch wheatgrass, threadleaf sedge, prairie junegrass, and needle-and-thread. Growth of native, cool-season plants typically begins around April 15 and continues to mid-July, however, the composition and production will vary naturally due to historical use, fluctuating precipitation, and fire frequency.

The Project Area includes areas of previous mining disturbances with varied levels of reclamation. An estimated 676 acres of previously mined lands have been reclaimed within the Project Area during various periods through 2011. Reclamation through the WDEQ-AML program has reclaimed 216 acres, 38 percent of all reclaimed land as of 2011. McIntosh Pit, located in the southwest corner of the Project Area, retains water year-round but the site lacks any significant emergent or bank vegetation. The highwalls surrounding the pit are steep and lack vegetation.

The Congo Pit area, located in the northeast section of the Project Area, has been reclaimed with primarily wheatgrasses (*Agropyron spp.*), as have other disturbance areas such as the Paydirt Pit. Thickspike wheatgrass (*Elymus lanceolatus ssp. lanceolatus*), bluebunch wheatgrass, western wheatgrass, slender wheatgrass (*Elymus trachycaulus ssp. trachycaulus*), needle-and-thread, Indian ricegrass, sainfoin (*Onobrychis vicaefolia*), and Wyoming big sagebrush have been successfully established through broadcast seeding and/or drill seeding applications (Energy Fuels, 2013). Reclaimed areas (BKS, 2014b) within the Project Area are included in Map 3.3-1.

3.3.3 Wetlands and Riparian Zones

Wetlands are defined by plants, soils, and frequency of flooding, and the three identified wetland areas within the Project Area are generally classified as freshwater ponds, freshwater forested/shrub, and freshwater emergent zones. Wetlands within the Project Area were previously identified through surveys conducted in conjunction with vegetation surveys in 2010 and 2011. Additionally, a desktop analysis using the National Wetlands Inventory (NWI) data was conducted and submitted to the U.S. Army Corps of Engineers (USACE) in 2013. This NWI data set represents the extent, approximate location, and type of wetlands and deep water habitats in the conterminous United States. These data delineate the extent of wetlands and surface waters as defined by Cowardin et al. (1979) within the WDEQ-LQD Permit to Mine 381C Permit Area, as mapped on the NWI database. The 2013 desktop analysis of the NWI data indicated multiple wetlands within the Project Area. Based on the desktop analysis, the USACE requested a full aquatic resources inventory (ARI) for the Project Area to determine the presence of wetlands after disturbance from mining over the past 40 years. BKS conducted the ARI in June 2013 (BKS, 2013) and Energy Fuels submitted the findings to the USACE for review. Identification of potential wetlands was based on visual assessment of vegetation and hydrology indicators, as well as soil sampling to determine the presence of wetland criteria indicators.

The NWI data indicated nine wetlands within the proposed disturbance boundary; however, only one wetland, Sediment Control Basin-1 (also called SW-1) in Section 17, was still present during the 2013 ARI. The other eight wetlands were no longer present due to previous mining disturbances. SW-1 is an ephemeral impoundment that receives water in the spring from snowmelt or following large storm events and is dry for most of the year (Lidstone, 2013). BKS classified the wetland as a Palustrine Unconsolidated Bottom (PUBh) wetland which encompasses approximately 0.20 acre within the proposed Project disturbance areas. The dominant vegetation is sedge, Dudley's rush, Kentucky bluegrass, and water whorl grass. In addition to the 0.20 acre that make up SW-1, 0.10 acre of ephemeral drainages (R6 classification-riverine ephemeral), and 1.71 acres of other sediment control features were identified as aquatic resources within the Project Area. McIntosh Pit is not classified as a wetland due to the lack of vegetation surrounding the open water (BKS, 2013).

According to the 2013 ARI, the majority of the wetlands occur in the southeast corner of the Project Area near Western Nuclear Pond, outside the proposed disturbance boundary. Wetlands near Western Nuclear Pond are freshwater aquatic bed, palustrine emergent wetlands, and palustrine scrub-shrub which total approximately 9.10 acres. Approximately 0.29 acre of palustrine emergent wetlands occur along a tributary of Sheep Creek on the eastern edge of the Project Area, outside the area proposed for disturbance.

The USACE (2014) provided a partial jurisdictional determination for the proposed area of disturbance because there are no waters of the U.S. within the 723-acre area (see Map 3.3-2). The USACE determined that an extensive evaluation to determine jurisdiction over streams and wetlands within the Permit Area beyond the area of disturbance should not be necessary at this time because the Department of the Army authorization is not required for any uranium mining activities as defined in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

In July of 2004, streams within the Sweetwater watershed were evaluated to determine Proper Functioning Condition (PFC) by the University of Wyoming on public lands. A one mile stretch of a tributary to Crooks Creek southeast of the Project Area near Crooks Creek Reservoir in Section 10 of T27N R92W, was rated as being Functional at Risk and in a downward trend (FAR-D). Two short stretches along Crooks Creek to the south of the Project Area in sections 8 and 17 of T27N R92W, were rated to be in PFC. There has been no determination of PFC on the wetlands adjacent to Western Nuclear Pond.

3.3.4 Special Status Species

3.3.4.1 ESA-Listed, Proposed, and Candidate Species

There are a total of seven threatened or endangered species included by the FWS on the Official Species List (FWS, 2016) for the Sheep Mountain Project Area dated February 22, 2016 (see Table 3.3-2). The following endangered and threatened species could occur in riverine habitats of the Platte River System downstream from the Project Area: Least tern (*Sternula antillarum*, endangered), Piping Plover (*Charadrius melodus*, threatened), Whooping crane (*Grus americana*, endangered), Pallid sturgeon (*Scaphirhynchus albus*, endangered), and Western Prairie Fringed Orchid (*Platanthera praeclara,* endangered). Ute ladies'-tresses orchid (*Spiranthes diluvialis,* threatened) and Gray wolf (*Canis lupus*, Experimental population-non essential) were also included on the Official Species List (FWS, 2016).

Yellow-billed cuckoo (*Coccyzus americanus),* listed as threatened under the ESA (FWS, 2014a), was not included on the FWS Official Species List for the Project Area and is not included in Table 3.3-1. They are considered a riparian-obligate species and are usually found in large tracts of cottonwood/willow habitats with dense sub-canopies (FWS, 2007). The route to the Sweetwater Mill does not provide suitable habitat for yellow-billed cuckoos. They are not expected in any area associated with the Project and, therefore, are not discussed further.

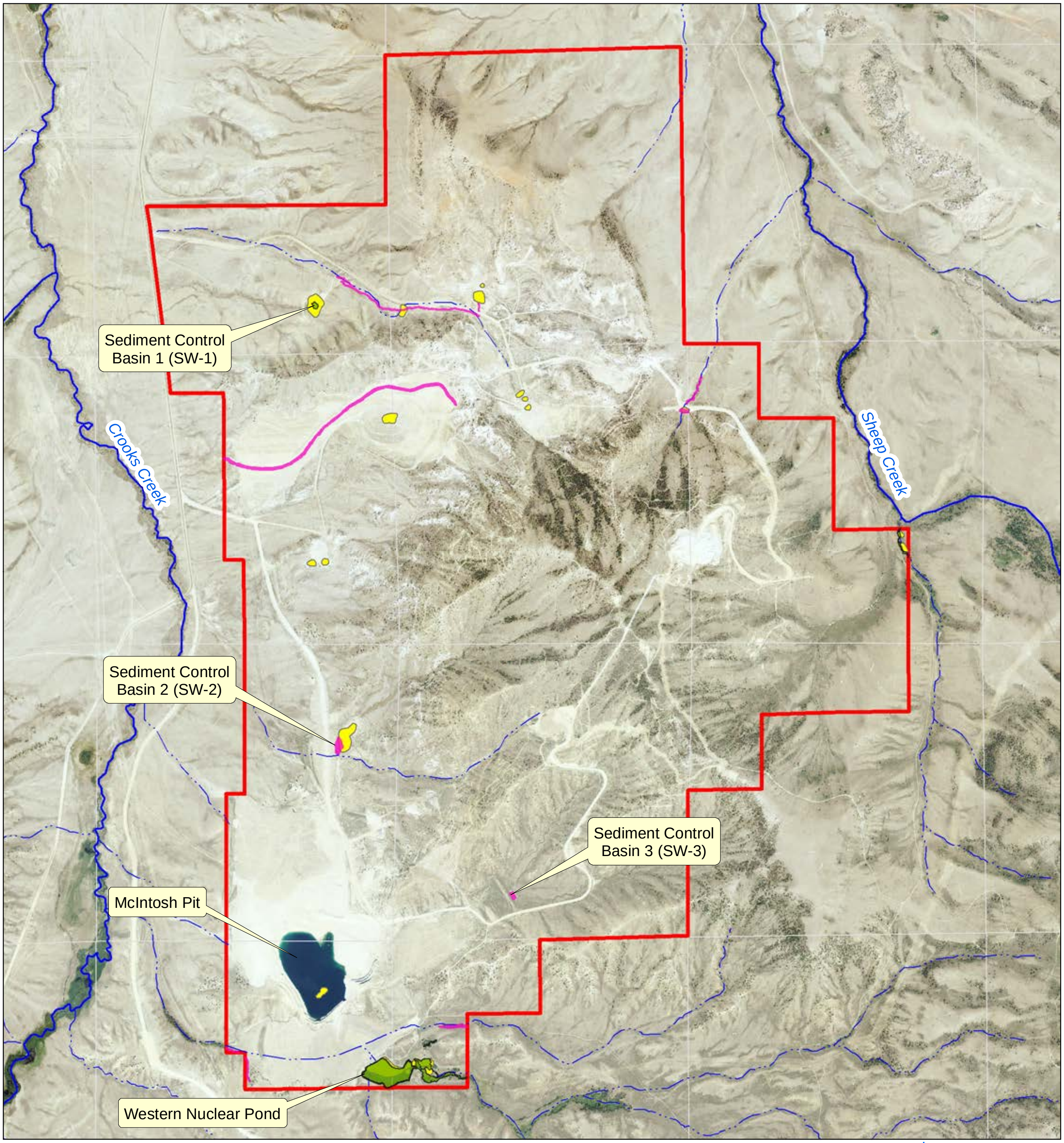
Table 3.3-2
U.S. Fish and Wildlife Service Official Species List[1]

Species	Status	Has Critical Habitat
Birds		
Least tern (*Sterna antillarum)*	Endangered	
Piping Plover (*Charadrius melodus*)	Threatened	Final designated
Whooping crane (*Grus Americana*)	Endangered	Final designated
Fishes		
Pallid sturgeon (*Scaphirhynchus albus*)	Endangered	
Flowering Plants		
Ute ladies'-tresses (*Spiranthes diluvialis*)	Threatened	
Western Prairie Fringed Orchid (*Platanthera praeclara*)	Threatened	
Mammals		
Gray wolf (*Canis lupus*)	Experimental Population, Non-Essential	
[1] Source: FWS, 2016.		

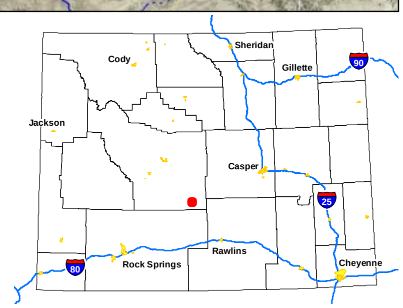
Platte River Species. The Project is located within the North Platte River Basin. Potential depletions of surface water or groundwater flowing to the river require evaluation in accordance with the 2001 decision by the U.S. Supreme Court, which established a new legal distribution of the North Platte River among Nebraska, Wyoming, and Colorado.

Ute Ladies'-tresses. Ute ladies'-tresses orchid was listed as threatened in 1992 (FWS, 1992). Populations have been reported in Niobrara, Converse, Goshen, and Laramie counties but not in Fremont County (Fertig et al., 2005). Ute ladies'-tresses inhabits seasonally flooded river terraces, subirrigated or spring-fed abandoned stream channels and valleys, and lakeshores (FWS, 1992). During the past decade, surveys for the species have located additional populations along irrigation canals, berms, levees, irrigated meadows, excavated gravel pits, roadside borrow pits, reservoirs, and other human-modified wetlands (Fertig et al., 2005).

The FWS (2013a) determined that approximately the western third of the Project Area in the vicinity of Crooks Creek and the northeastern portion in the vicinity of Sheep Creek are within the Section 7 consultation ranges for Ute ladies'-tresses orchid. Surveys were conducted from June through August, 2010 (BKS, 2011c). No habitat or individuals or populations of Ute ladies'-tresses were present within the Project Area and there were no records of the species occurring in the Project Area from the WYNDD (BKS, 2011c). The banks of Western Nuclear Pond located in Section 32 and Section 33 were dominated by foxtail barley (*Hordeum jubatum*), needleleaf sedge, and Nebraska sedge. The soil was clay, the water was stagnant, and there was no transition zone between the water and the mesic area of the banks. All of these characteristics are negative indicators for Ute ladies'-tresses habitat. The drainage leading into the pond in Section 32 from Section 33 did not have water present during the August 2010 survey; the lack of a late season water source excludes this area as potential Ute ladies'-tresses habitat (BKS, 2011c).



Map 3.3-2
Wetlands in Relation to the Project Area



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Feet

- Sheep Mountain Project Area
- 2014 Wetland Boundary
- 2014 R6 Drainages
- Perennial Streams
- Ephemeral Streams
- NWI Wetlands

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Gray Wolf. The gray wolf is managed under section 10(j) of the ESA as experimental, non-essential, and is currently treated as a species proposed for listing on all lands outside of National Park Service lands and National Wildlife Refuges where they are treated as threatened. The Project Area lies about 70 to 80 miles southeast of the Soda Lake pack, the closest extant pack in Wyoming. Wolves in the Soda Lake pack have been subject to harvest and control measures through 2014 (WGFD et al., 2015). Wolves have been observed in the South Wind River Mountains, east of the Project Area, but established pack(s) have not been confirmed. Once a given area is occupied by resident wolf packs, it generally becomes saturated and wolf numbers become regulated by the amount of available prey, intra-species conflict, other forms of mortality, and dispersal. Dispersing wolves may cover large areas as they try to join other packs or attempt to form their own pack in unoccupied habitat (FWS, 2009a). It is possible that a dispersing wolf from the Soda Lake pack or another pack(s) in the Greater Yellowstone Area could occur on or in the vicinity of the Project Area, given the presence of seasonal ranges used by prey species (elk, mule deer, moose - see Section 3.3.5.1, below). The Project Area is within the historical range of gray wolves although no records of occurrence are available (WYNDD, 2016).

3.3.4.2 Migratory Birds

The Migratory Bird Treaty Act (MBTA), as amended, implements treaties for the protection of migratory birds. EO 13186, issued in 2001, directed actions that would further implement the MBTA. As required by the MBTA and EO 13186, the BLM signed a MOU with the FWS in April 2010, which is intended to strengthen migratory bird conservation efforts by identifying and implementing strategies to promote conservation and reduce or eliminate adverse impacts on migratory birds. The focus of BLM's conservation efforts are on migratory species and some non-migratory game bird species that are listed as Birds of Conservation Concern (BCC). In the MOU and pursuant to the MBTA and EO 13186, the BLM committed to consider management objectives resulting from comprehensive planning efforts (e.g., Partners in Flight Conservation Plan). BCC have been identified by the FWS (2008) for different Bird Conservation Regions (BCR) in the United States. The entire Project Area is in BCR 10, the Northern Rockies region.

Thirteen BCC species could occur within the Project Area, based on the species' known distributions and habitat associations in central Wyoming (WGFD, 2009), and documented occurrence on-site and/or the region surrounding the Project Area. Included in Table 3.3-3 is the Conservation Priority for species identified by Wyoming Partners in Flight (Nicholoff, 2003). Only one BCC species, Brewer's sparrow (*Spizella breweri*) was observed during on-site surveys in 2010 (Real West Natural Resource Consulting – Real West, 2011) (see Table 3.3-3). However, four other BCC species have been recorded by WYNDD within 4 miles of the Project Area (WYNDD output in 2010, Real West, 2011) and their occurrence on-site is possible. Those species include ferruginous hawk (*Buteo regalis*), sage thrasher (*Oreoscoptes montanus*), loggerhead shrike (*Lanius ludovicianus*), and sage sparrow (*Amphispiza belli*).

Long-term (1994 to 2013) population trends within BCR 10 are available for the 13 BCC species (Sauer et al., 2014) and are included in Table 3.3-3. The long-term trends within BCR 10 for Swainson's hawk (*Buteo swainsonii*), ferruginous hawk, and peregrine falcon (*Falco perigrinus*) indicate their populations are stable. Long-billed curlews (*Numenius americanus*) are increasing in the region although olive-sided flycatcher (*Contopus cooperi*), sage thrasher (*Oreoscoptes montanus*), and Cassin's finch (*Carpodacus cassinii*) are decreasing in BCR 10. Data compiled for 17 National Biological Survey Breeding Bird Survey routes (BBS - Sauer et al., 2014) within a 60-mile area surrounding the Project Area indicates that local populations of loggerhead shrikes have been increasing during the past 20 years, 1995 to 2014 (see Table 3.3-3). Populations of sagebrush-obligate species, sage thrashers, Brewer's sparrows, and sage sparrows in the local area appear to have been stable (neither increasing nor decreasing) during the 20-year period.

Table 3.3-3
Birds of Conservation Concern within Bird Conservation Region 10 (Northern Rockies) that Occur or May Occur in the Project Area [1]

Common Name Scientific Name	Habitat [2]	Conservation Priority [3]	Observed On-site [4]	BCR Trend [5] 1994 to 2013	Local Trend [6] 1995 to 2014
Swainson's Hawk *Buteo swainsonii*	Nests in a tree, occasionally on a cliff; in most habitats below 9,000 feet with open areas for foraging.	Level I	No	No trend	Insufficient data
Ferruginous Hawk *Buteo regalis*	Nests in isolated trees, rock outcrops, artificial structures, ground near prey base.	Level I	No	No trend	Insufficient data
Peregrine Falcon *Falco peregrinus*	Nests on high cliff faces, often near water; forages in adjacent habitats.	Level I	No	No trend	Insufficient data
Long-billed Curlew *Numenius americanus*	Nests on the ground; often in wet-moist meadow grasslands or irrigated native meadows with aquatic areas nearby.	Level I	No	Increasing	Insufficient data
Lewis' Woodpecker *Melanerpes lewis*	Nests in a cavity of dead or lie tree in pine-juniper or other coniferous forest.	Level II	No	No trend	Insufficient data
Olive-sided Flycatcher *Contopus cooperi*	Nests often high in a conifer in forests from ≈8,000 feet to timberline.	Level II	No	Decreasing	Insufficient data
Willow Flycatcher *Epidonax traillii*	Nests in fork-branched riparian shrub, including willow, below 9,000 feet.	Level II	No	No trend	Insufficient data
Loggerhead Shrike *Lanius ludovicianus*	Nest is usually in deciduous tree or shrub in pine-juniper woodland or basin-prairie shrublands.	Level II	No	No trend	Increasing
Sage Thrasher *Oreoscoptes montanus*	Nest is concealed in or beneath a sagebrush shrub in sagebrush shrublands.	Level II	No	Decreasing	No trend
Brewer's Sparrow *Spizella breweri*	Nests in sagebrush, occasionally greasewood, rabbitbrush in shrublands.	Level I	Yes	No trend	No trend
Sage Sparrow *Amphispiza belli*	Usually nests in or under sagebrush shrub in sagebrush shrublands.	Level I	No	No trend	No trend
McCown's Longspur *Calcarius mccownii*	Nests in a depression on the ground in grasslands and basin prairie shrublands.	Level I	No	No trend	Insufficient data
Cassin's Finch *Carpodacus cassinii*	Nests in montane forests with spruce/fir and aspen; also in lower pinyon-juniper woodlands.	Level IV	No	Decreasing	Insufficient data

Notes:
[1] Species observed on-site and/or reported on one or more of 17 Breeding Bird Survey routes within 60 miles surrounding the Project Area in Fremont, Natrona, Sweetwater and Carbon counties between 1995 and 2014.
[2] WGFD, 2009.
[3] Conservation Priority from the Wyoming Bird Conservation Plan (Nicholoff, 2003).
Level I: Species needs conservation action.
Level II: Species' status requires monitoring.
Level IV: Species of concern but not considered a priority species.
[4] Real West, 2011 and 2013.
[5] Sauer et al., 2014.
[6] Linear trends of birds counted per route averaged for data available on 17 Breeding Bird Survey routes within 60 miles surrounding the Project Area in Fremont, Natrona, Sweetwater and Carbon counties between 1995 and 2014.

A total of 165 bird species listed as Nearctic and Neotropical migratory birds by the FWS, Division of Bird Habitat Conservation, and protected under the MBTA (FWS, 2010a) have been observed on the 17 BBS routes within 60 miles from the Project Area during the past 20 years. Of those 165 bird species, 133 species might occur in habitats present on or adjacent to the Project Area (see Nongame Wildlife, below) but 30 migratory bird species were observed within the Project Area during 2010 and 2011 (Real West, 2011). Trends for 13 species in the local surrounding area indicate their populations have been decreasing during the past 20 years, while populations for eight species appear to be increasing. Killdeer (*Charadrius vociferous*), Wilson's snipe (*Gallinag delicata*), mourning doves (*Zenaida macroura*), horned lark (*Eremophila alpestris*), cliff swallow (*Petrochelidon pyrrhonata*), barn swallow (*Hirundo rustica*), yellow warbler (*Setophaga petchia*), red-winged blackbird (*Aeglaius phoeniceus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), Brewer's blackbird (*Euphagus cyanocephalus*), and American goldfinch (*Spinus tristis*) are species that have been observed within the Project Area and have declining populations in the surrounding area. Loggerhead shrikes and green-tailed towhees (*Pipilo chlorurus*) were the only species observed in the Project Area with populations that have been increasing locally during the past 20 years.

Nesting chronologies are not available for migratory bird species in the region or for those observed on-site during 2010 and 2011. For birds observed within the Project Area, the median date that migratory species arrive in Wyoming during spring is April 15. Fall migration for most species is underway by August 15 (Faulkner, 2010).

Two nesting migratory bird species seen in the vicinity of the Project Area were raptors: there was one active great horned owl (*Bubo virginianus*) nest in 2010 and one active red-tailed hawk (*Buteo jamaicensis*) nest during 2011 within 0.5 mile of the Project Area (Real West, 2011). An inactive great horned owl nest was found in an abandoned mine building. The building was removed in 2011. Three other raptor nests, in various states of repair, were found within the 0.5-mile surveyed area but none was active in 2010 and/or 2011. During 2014, a pair of red-tailed hawks nested in a former great-horned owl nest and a newly discovered red-tailed hawk on a rock pinnacle was active (Real West, 2014). In addition, prairie falcons (*Falco mexicanus*) have been observed nesting on a highwall at McIntosh Pit (Church, 2013), within the southern portion of the Project Area.

3.3.4.3 BLM and Wyoming Special Status Species

The current BLM Wyoming Sensitive Species List (BLM, 2016a) includes 37 sensitive species within the BLM Lander Field Office planning area (included in Table 3.3-4). The WGFD (2010) revised the State Wildlife Action Plan which identifies Wyoming Species of Greatest Conservation Needs (SGCN) and assigns each species at risk of population decline and/or habitat threatas/loss a Native Species Status number, 1 through 4. The State Wildlife Action Plan also assigns priorities for conservation of SGCN species ranging from Tier I, highest priority to Tier III, lowest priority. Those designations are included in Table 3.3-4.

The Project Area was surveyed for Special Status plants in 2010 (BKS, 2011c) and for Special Status animals in 2010, 2011, 2012 and 2013 (Real West, 2013). There are three species in Table 3.3-4 that are known to be present within or adjacent to the Project Area, based on field observations: Brewer's sparrow, northern leopard frog, and limber pine. Based on habitats present and species' distributions in Wyoming (WGFD, 2009) and presence within 4 miles of the Project Area as documented by WYNDD (WYNDD output in 2010, Real West, 2011, WYNDD, 2016), occurrence of four mammal species and 10 bird species are possible within the Project Area and are discussed below. Locations of BLM-sensitive plants were obtained from records maintained by the Rocky Mountain Herbarium at the University of Wyoming and WYNDD.

Table 3.3-4
BLM and Wyoming Sensitive Wildlife and Plant Species that Could Potentially Occur in the Vicinity of the Mine Project Area

Common Name Scientific Name	Habitat [1, 2]	Potential Occurrence [3, 4]	BLM Status [5]	WGFD Status [6]	WYNDD Global/State Status [7]
Mammals					
Long-eared Myotis *Myotis evotis*	Roosts in caves, buildings, mine tunnels. Found in coniferous forests, cottonwood-riparian; basin-prairie shrublands; sagebrush-grasslands.	Possible, Observed in Degree Block 18, but not observed on-site	BLM-S	NSS3 Tier II	G5/S4
Spotted Bat *Euderma maculatum*	Roosts in rock crevices. Maternity roosts are extremely sensitive to human disturbance. Known only from juniper shrublands, desert sagebrush-grasslands in Wyoming. Cliffs over perennial water, an important habitat feature.	Unlikely, No records in Degree Block 18	BLM-S	NSS3 Tier II	G4/S3
Townsend's Big-eared Bat *Corynorhinus townsendii*	Day roosts in caves, mines, rock outcrops; night roosts in buildings. Hibernates in caves. Deciduous forests, dry coniferous forests, shrublands, desert grasslands, juniper in Wyoming.	Possible, Observed in Degree Block 18, but not observed on-site	BLM-S	NSS2 Tier I	G4/S2
Pygmy Rabbit *Brachylagus idahoensis*	Nests on the ground, most likely under sagebrush, or in a burrow in dense, tall stands of big sagebrush, usually along intermittent streams or riparian areas in sagebrush-grasslands.	Possible, Record within 4 miles (WYNDD)	BLM-S	NSS3 Tier II	G4/S1
White-tailed Prairie Dog *Cynomys leucurus*	Burrows in basin-prairie and mountain-foothills shrublands, sagebrush-grasslands, shortgrass and midgrass grasslands.	Possible, Breeds in Degree Block 18, but not observed on-site	BLM-S	None	G4/S3
Swift Fox *Vulpes velox*	Uses underground dens year-round in eastern great plains grasslands, occasionally agricultural areas, irrigated native meadows, roadside/railroad banks.	Unlikely, No records in Degree Block 18	BLM-S	NSS4 Tier II	G3/S2
Birds					
Trumpeter Swan *Cygnus buccinators*	Marshes, lakes, rivers. Nests on a muskrat house, a very small island, or a piece of floating bog.	None, No records in Degree Block 18, habitat absent	BLM-S	NSS2 Tier II	G4/S2
Greater Sage-grouse *Centrocercus urophasianus*	Basin-prairie and mountain-foothills shrublands, wet-moist meadows, alfalfa, irrigated native meadows. Nests on the ground under a sagebrush shrub.	Possible, Record within 4 miles (WYNDD)	BLM-S	NSS2 Tier II	G4/S4
White-faced Ibis *Plegadis chihi*	Marshes, wet-moist meadows, lakes, irrigated meadows. Nests in bulrushes or cattails, occasionally on the ground on an island.	Unlikely, Observed in Degree Block 18, habitat absent	BLM-S	NSS3 Tier II	G5/S1B

Common Name Scientific Name	Habitat [1, 2]	Potential Occurrence [3, 4]	BLM Status [5]	WGFD Status [6]	WYNDD Global/State Status [7]
Bald Eagle *Haliaeetus leucocephalus*	Nests in a tree, conifers or cottonwood-riparian near large lakes and rivers. Forages in open habitats during the winter. Feeds mostly on fish; also on waterfowl, carrion.	Possible, Observed in Degree Block 18, but not observed on-site	BLM-S	NSS2 Tier II	G5/S3B
Northern Goshawk *Accipiter gentilis*	Nests in a tree in coniferous, deciduous forests, especially Douglas-fir, lodgepole pine, and aspen.	Unlikely, Record within 4 miles (WYNDD), but habitat absent	BLM-S	NSSU Tier I	G5/S3
Ferruginous Hawk *Buteo regalis*	Nests on a rock outcrop, the ground, a bank, or in a tree in basin-prairie shrublands, grasslands, rock outcrops.	Possible, Record within 4 miles (WYNDD)	BLM-S	NSSU Tier I	G4/S4B
Peregrine Falcon *Falco peregrinus*	Nests on a ledge or in a hole on a tall cliff in most habitats. Feeds on birds.	Unlikely, Observed in Degree Block 18, but habitat absent	BLM-S	NSS3 Tier II	G4/S1B
Mountain Plover *Charadrius montanus*	Nests on the ground, somewhat exposed in short grass and mixed-grass prairie, openings in shrub ecosystems, prairie dog towns.	Possible, Record within 4 miles (WYNDD)	BLM-S	NSSU Tier I	G3/S2
Long-billed Curlew *Numenius americanus*	Nests on the ground near water in sagebrush-grasslands; mountain foothills, and wet-moist meadow grasslands; irrigated native meadows.	Possible, Breeds in Degree Block 18, but habitat absent	BLM-S	NSS3 Tier II	G5/S3B
Yellow-billed Cuckoo *Coccyzus americanus*	Nests usually in a shrub in cottonwood-riparian below 7,000 feet, urban areas, open woodlands, streamside willow and alder groves.	None, No suitable habitat, no records in Degree Block 18	BLM-S	NSSU Tier III	G5/S1
Burrowing Owl *Athene cunicularia*	Nests in a mammal burrow, especially that of a prairie dog in grasslands, basin-prairie shrublands, agricultural area.	Possible, Breeds in Degree Block 18, but not observed on-site	BLM-S	NSSU Tier I	G4/S3
Loggerhead Shrike *Lanius ludovicianus*	Nest is usually hidden below the crown of a deciduous tree or shrub in pine-juniper woodland, basin-prairie and mountain-foothills shrublands.	Possible, Record within 4 miles (WYNDD)	BLM-S	None	G4/S3
Sage Thrasher *Oreoscoptes montanus*	Nest is concealed in or beneath a sagebrush shrub in basin-prairie shrub, mountain-foothill shrublands.	Possible, Record within 4 miles (WYNDD)	BLM-S	NSS4 Tier II	G5/S5
Brewer's Sparrow *Spizella breweri*	Nests in a shrub in basin-prairie and mountain-foothills shrublands, especially sagebrush.	Present, observed on-site	BLM-S	NSS4 Tier II	G5/S5
Sage Sparrow *Amphispiza belli*	Usually nests in or under sagebrush in basin-prairie and mountain-foothills shrublands.	Possible, Record within 4 miles (WYNDD)	BLM-S	NSS4 Tier II	G5/S3

Common Name Scientific Name	Habitat [1, 2]	Potential Occurrence [3, 4]	BLM Status [5]	WGFD Status [6]	WYNDD Global/State Status [7]
Amphibians					
Great Basin Spadefoot *Spea intermontana*	Spring seeps, permanent and temporary waters in sagebrush communities below 6,000 feet, west of the Continental Divide.	Unlikely, No records in Degree Block 18	BLM-S	NSSU Tier I	G5/S3
Boreal Toad *Anaxyrus (Bufo) boreas boreas*	Northern Rocky Mountain Population in wet areas in foothills, montane, and subalpine zones from 8,000 to 11,000 feet.	Unlikely, No records in Degree Block 18	BLM-S	NSS1 Tier I	G4/S1
Northern Leopard Frog *Lithobates (Rana) pipiens*	Swampy cattail marshes, beaver ponds, streams, rivers, and lakes in the plains, foothills, and montane zones up to 9,000 feet.	Present, observed adjacent to site	BLM-S	NSSU Tier III	G5/S3
Columbia Spotted Frog *Rana luteiventris*	Ponds, sloughs, and small streams in the foothills and montane zones.	Unlikely, No records in Degree Block 18	BLM-S	NSS3 Tier II	G4/S3
Fish					
Yellowstone Cutthroat Trout *Oncorhynchus clarkii bouvieri*	Yellowstone River drainage, small mountain streams and large rivers. Introduced east of the Continental Divide.	None, Not in Sweetwater Drainage	BLM-S	NSS2 Tier I	G4/S2
Plants					
Meadow Pussytoes *Antennaria arcuata*	Moist, hummocky meadows, seeps, or springs surrounded by sagebrush grasslands. Present in the Sweetwater River valley, elevations 4,950-7,900 feet.	Unlikely, habitat present, but closest record 19 miles away	BLM-S	N/A	G2/S2
Porter's Sagebrush *Artemisia porter*	Sparsely vegetated badlands of ashy or tufaceous mudstones and clay slopes in the Wind River Basin, elevations 5,300-6,500 feet.	Unlikely, habitat absent, closest record 30 miles away	BLM-S	N/A	G2/S2
Dubois Milkvetch *Astragalus gilviflorus* var. *purpureus*	Barren shale, badlands, limestone, and redbed slopes and ridges in the northwest Wind River Basin, elevations 6,900-8,800 feet.	Unlikely, habitat absent, closest record 108 miles away	BLM-S	N/A	G5/S2
Cedar Rim Thistle *Cirsium aridum*	Barren, chalky hills, gravelly slopes, and fine-textured, sandy-shaley draws in Wind River Basin, elevations 6,700-7,200 feet.	Unlikely, habitat absent, closest record 15 miles away	BLM-S	N/A	G2/S2
Owl Creek Miner's Candle *Cryptantha subcapitata*	Sandy-gravelly slopes and desert ridges on sandstones of the Wind River Formation in the Owl Creek Mountains and North Wind River Basin, elevations 4,700-6,000 feet.	Unlikely, habitat absent, closest record 65 miles away	BLM-S	N/A	G2/S2
Fremont Bladderpod *Lesquerella (Physaria) fremontii*	Rocky limestone slopes and ridges in the southeastern Wind River Range, elevations 7,000-9,000 feet.	Unlikely, closest record 33 miles away	BLM-S	N/A	G2/S2

Common Name Scientific Name	Habitat [1, 2]	Potential Occurrence [3, 4]	BLM Status [5]	WGFD Status [6]	WYNDD Global/State Status [7]
Beaver Rim Phlox *Phlox pungens*	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates in the Wind River Basin, elevations 6,000-7,400 feet.	Unlikley, habitat present, but closest record 25 miles away	BLM-S	N/A	G2/S2
Rocky Mountain Twinpod *Physaria saximontana* var. *saximontana*	Sparsely-vegetated rocky slopes of limestone, sandstone, or clay in Wind River and Bighorn basins, elevations 5,600-8,300 feet.	Possible, present historically in Project Area (WYNDD)	BLM-S	N/A	G2/S2
Limber Pine *Pinus flexilis*	Timberline and at lower elevation with sagebrush. Associated species are lodgepole pine, Engelmann spruce, whitebark pine, Rocky Mountain Douglas-fir, subalpine fir, Rocky Mountain juniper, Mountain Mahogany, and common juniper.	Present, observed within Project Area	BLM-S	N/A	G4/S5
Persistent Sepal Yellowcress *Rorippa calycina*	Riverbanks and shorelines, usually on sandy soils near high water line, elevations 4,300-6,800 feet.	Unlikely, closest record 25 miles away	BLM-S	N/A	G3/S3
Barneby's Clover *Trifolium barnebyi*	Ledges, crevices, and seams on reddish-cream Nugget Sandstone outcrops in the southeast Wind River Range, elevations 5,600-6,700 feet.	Unlikely, closest record 41 miles away	BLM-S	N/A	G1G2/S1S2

Notes:
[1] Vertebrate habitat descriptions from WGFD, 2009.
[2] Plant habitat descriptions from Wyoming Rare Plant Field Guide (USGS, 2006).
[3] Potential occurrence of vertebrates in Degree Block 18, based on WGFD, 2009.
[4] Potential occurrence of plants based on locations of species in records available from the Rocky Mountain Herbarium, online at http://www.rmh.uwyo.edu/.
[5] Federal Status abbreviations: BLM-S = BLM Sensitive Species.
[6] WGFD Status: Wyoming 2010 Species with Greatest Conservation Need. Available at https://wgfd.wyo.gov/WGFD/media/content/PDF/Habitat/SWAP/Wyoming-SGCN.pdf. Species ranked from NSS1 (highest) through NSS4 (lowest) were considered to be Species of Greatest Conservation Need (SGCN) in the Wyoming State Wildlife Action Plan; species identified as NSSU (Unknown) require additional information.
State Wildlife Action Plan priorities for conservation of SGCN species: Tier I – highest priority, Tier II – moderate priority, Tier III – lowest priority.
[7] Wyoming Natural Diversity Database Status:
Global Rank: G1 = Critically Imperiled, G2= Imperiled, G3= Vulnerable, G4 = Apparently Secure, G5 = Widespread, abundant.
State Rank: S1= Critically Imperiled, S2= Imperiled, S3= Vulnerable, S4 = Apparently Secure; S5 = Widespread, abundant. A “B” after the rank indicates the rank applies to Breeding Habitat; NA = Not Applicable.

Mammals

None of the six mammal species in Table 3.3-4 has been observed on-site. White-tailed prairie dogs (*Cynomys leucurus*) and pygmy rabbits (*Brachylagus idahoensis*) occur in the region, based on their distributions in the Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming (WGFD, 2009). White-tailed prairie dogs occur along the Crooks Gap/Wamsutter Road, between US Highway 287 and the Project Area and may occur along the Crooks Gap/Wamsutter Road and Minerals Exploration Road to the Sweetwater Mill. Multiple records of pygmy rabbits within 4 miles of the Project Area are observations of burrows and fecal pellets (WYNDD, 2016).

Although no bats were reported within the Project Area during any of the wildlife surveys, species associated with mines, shafts, and adits (see species listed in Hester and Grenier, 2005) may be present and inhabit those features in the Project Area. Included are the long-eared myotis (*Myotis evotis*), spotted bat (*Euderma maculatum*), and Townsend's big-eared bat (*Corynorhinus townsendii*) (see Table 3.3-4).

Many of the BLM-sensitive bird species in Table 3.3-4 are also BCC, addressed above (Table 3.3-3 and Section 3.3.4.2). Brewer's sparrow was observed during on-site surveys in 2010 and four other species have been recorded by WYNDD within 4 miles of the Project Area and their occurrence on-site is possible including ferruginous hawk, sage thrasher, loggerhead shrike, and sage sparrow. Northern goshawk (*Accipiter gentilis*) was also reported within the 4-mile radius (WYNDD, 2016) but their occurrence on-site is unlikely due to absence of suitable nesting habitat.

Greater Sage-Grouse

Greater Sage-Grouse Core Area Protection (EO 2008-2), implemented first by Wyoming Governor Freudenthal in 2008, renewed in 2010 (EO 2010-4), revised by Governor Mead in 2011 (EO 2011-5), and replaced in 2015 (EO 2015-4) (State of Wyoming, 2015), established Core Population Areas (Core Area) with which new developments are managed to prevent declines in greater sage-grouse populations across the State.

On September 18, 2015, the BLM issued the Record of Decision and approved Resource Management Plan Amendment (ARMPA) for the Rocky Mountain Region including the BLM Rawlins Field Office (BLM, 2015a). This document identified three types of greater sage-grouse habitat: Sagebrush Focal Areas (SFAs), Priority Habitat Management Areas (PHMAs), and General Habitat Management Areas (GHMAs). The SFAs are important landscape blocks in the areas subject to the ARMPA with high breeding population densities of greater sage-grouse and existing high quality sagebrush. The SFAs and PHMAs together correspond to the areas identified by the State of Wyoming as Core Area. Several versions of core area have been developed. This EIS refers to version 3 which corresponds to the data in the LFO RMP. Version 4 of core area was developed summer 2015, but did not include any changes to the area analyzed in this EIS. GHMAs correspond to non-Core and are intended to provide greater flexibility for land use activities. The types of habitat in the Wyoming areas covered by the ARMPA are displayed on Map 2-1 in the ARMPA (BLM, 2015a).

The Crooks Gap/Wamsutter Road section located in the Rawlins Field Office (RFO) management area passes through lands the ARMPA identified as SFA while the Sweetwater Mill is located in lands identified as GHMA. Because the Project is located in the LFO management area and this document does not analyze any surface disturbance in lands managed by the RFO, this document uses the terms Core Area to include the SFAs in the RFO management area and non-Core Area to include the GHMA in the RFO management area.

At the closest points, the northeast border of the Project Area is 0.5 mile away and the southwest border is 0.3 mile from Core Area (see Map 3.3-3). Vehicle access to the Project Area on Crooks Gap/Wamsutter Road from US Highway 287 passes through a Core Area for 5 miles while access from the south on the Crooks Gap/Wamsutter Road crosses a Core Area for about 23 miles.

Surveys were conducted in 2010 using accepted techniques but no greater sage-grouse leks (communal mating sites) were found within 2 miles of the Project Area boundary (Real West, 2011). Leks are indicative of greater sage-grouse nesting habitats; most female greater sage-grouse nest within 2.1 to 4.8 miles from leks (Schroeder et al., 1999) although distances are highly variable (Connelly et al., 2004). Two leks within 6 miles of the Project Area were active in 2015.

Peak counts of males, averaged each year for active leks within an approximate 10-mile radius of the Project Area, indicate that the local population increased from 2002 through 2006 but it declined between 2006 and 2010. After 2010, the population remained stable or slightly increased between 2010 and 2012 but continued increase after 2013.

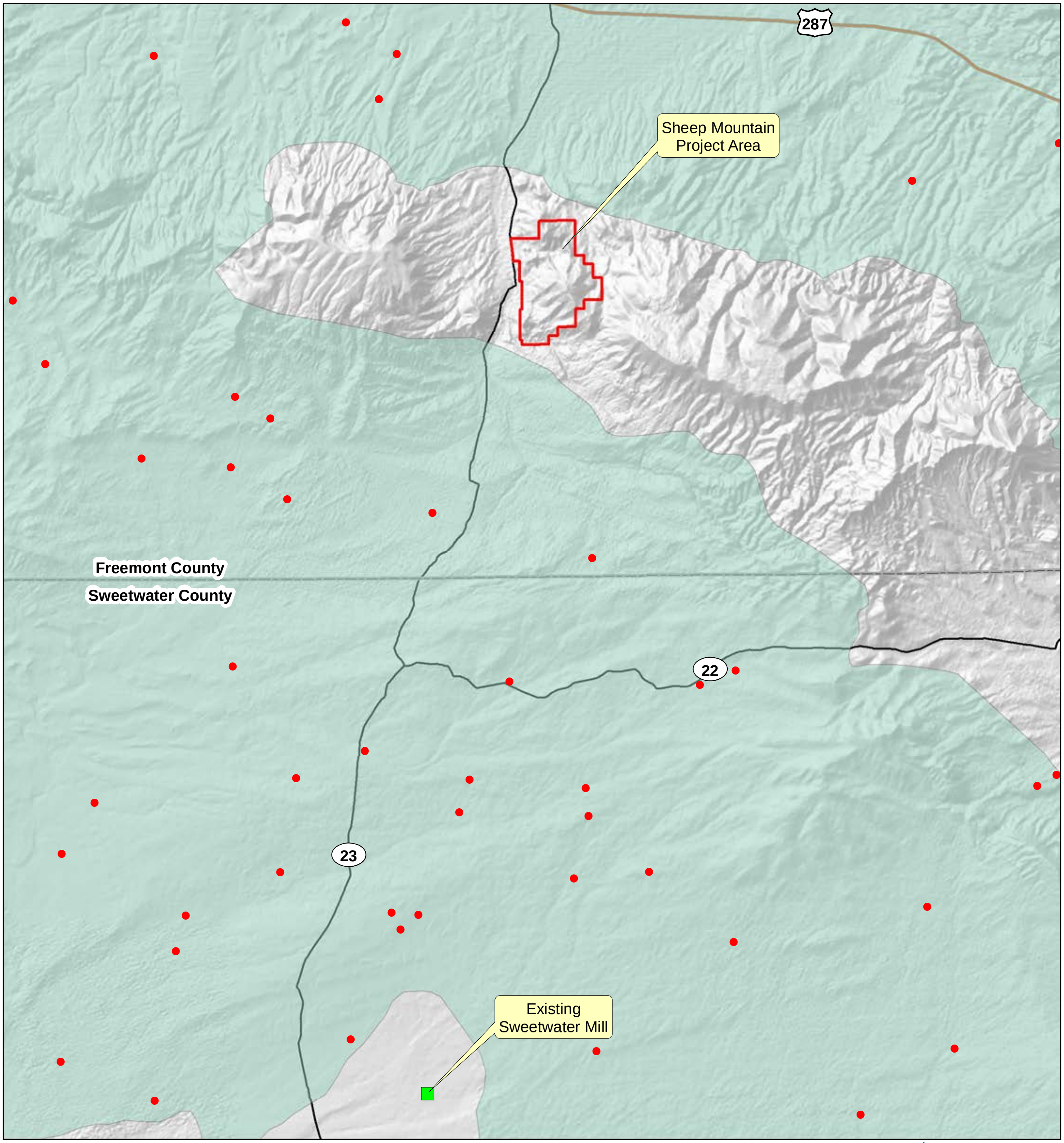
Amphibians and Fish

Of the four amphibian species in Table 3.3-4, the leopard frog (*Lithobates pipiens*) is the only one known to occur locally. Leopard frogs were found in Crooks Creek, approximately 0.33 mile west of the Project Area boundary (Real West, 2010). Also, leopard frogs were reported by the WGFD during 2009 and 2010 in the creek leading to Western Nuclear Pond (WYNDD, 2016), immediately south of the Project Area boundary. The only fish species in Table 3.3-4, Yellowstone Cutthroat Trout (*Oncorhynchus clarkii bouvieri*), is not found in the North Platte River Basin, including tributaries to the Sweetwater River.

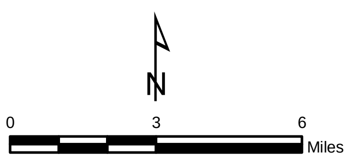
Plants

The WYNDD was queried for records of BLM-sensitive plant species within the Project Area but there were no occurrences (BKS, 2011c). Except for limber pine (*Pinus flexilis*), none of the other ten BLM-sensitive species of plants listed in Table 3.3-4 had been observed during surveys in 2011 although there are several historical records of Rocky Mountain twinpod (*Physaria saximontana var. saximontana*) on Sheep Mountain. According to WYNDD, Rocky Mountain twinpod (also known as Fremont County twinpod) is known from 21 extant occurrences in Wyoming, 15 of which have been relocated since 1990 (Glisson, 2004). There is a historical population on Sheep Mountain, observed in 1995, consisting of three small colonies with an estimate of 100 plants in one colony (BKS, 2011b citing WYNDD, 2003 and Glisson, 2004). The colonies occurred around elevation 6,950 feet in sandstone, limestone, and redbeds, in the Chugwater Formation on west-facing slope and the slopes were sparsely vegetated (BKS, 2011b). BKS (2011b) mapped approximately 122 acres within six polygons of potential habitat for the species in the Project Area and conducted searches for Rocky Mountain twinpod during June 2010. No individuals of Rocky Mountain twinpod were found during the on-site surveys (BKS, 2011b).

During the baseline study in the 1980s, limber pine was identified and rough species counts were conducted. The 1980s study area included the current Congo Pit disturbance area and associated haul roads. In 2010, limber pine was found throughout the Project Area and within the disturbance boundary, but most of the individuals were mainly in the central portion of the Project Area (BKS, 2011b). Limber pine habitat is located anywhere from 5,250 feet to 11,000 feet amsl in the Rocky Mountains. The species is often found on steep rocky slopes that do not support other vegetation types. The soil parent materials are derived from many types including: sandstone, limestone, granite, serpentine, quartzite, shale, obsidian, pumice, and calcareous substrates.



Map 3.3-3
Greater Sage-Grouse Core Area



Sheep Mountain Project Area
Occupied Sage Grouse Leks
Sage Grouse Core Areas

Data provided by Wyoming Game and Fish Department (Jun 2010)

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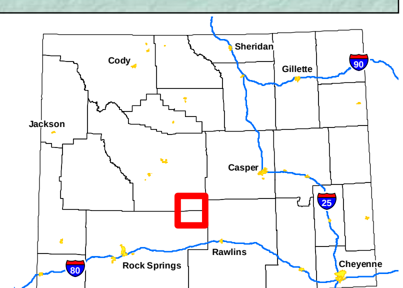


Limber pines are affected by Rocky Mountain pine beetle (*Dendroctonus ponderosae*), white pine blister rust (*Cronartium ribicola*), and limber pine dwarf mistletoe (*Arceuthobium cyanocarpum*) (Burns et al., 2011). These insect and disease agents are the leading causes of limber pine decline in the Rocky Mountains. In addition to these agents, limber pine is being affected by climate change. BLM Instruction Memorandum - IM No. WY-2011-003 established management guidelines for whitebark and limber pine in Wyoming, with the primary objective of maintaining stands on the landscape in the face of changing climate, insect infestations, and disease. IM No. WY-2011-003 was superceded by IM No. WY-2011-041 in August 2011 (BLM, 2011a).

In June 2011, Limber Pine-Big Sagebrush areas were sampled using the point center quarter method. Limber pine had an approximate density of 17.89 (sampled range from 2.73 to 107.00 trees per acre). White pine blister rust was evident on the limber pine trees within the stands surveyed. Many of the trees were succumbing to infestation and in poor health. Approximately 90 percent of the trees observed were suffering from white pine blister rust (BKS, 2011b).

3.3.5 Wildlife

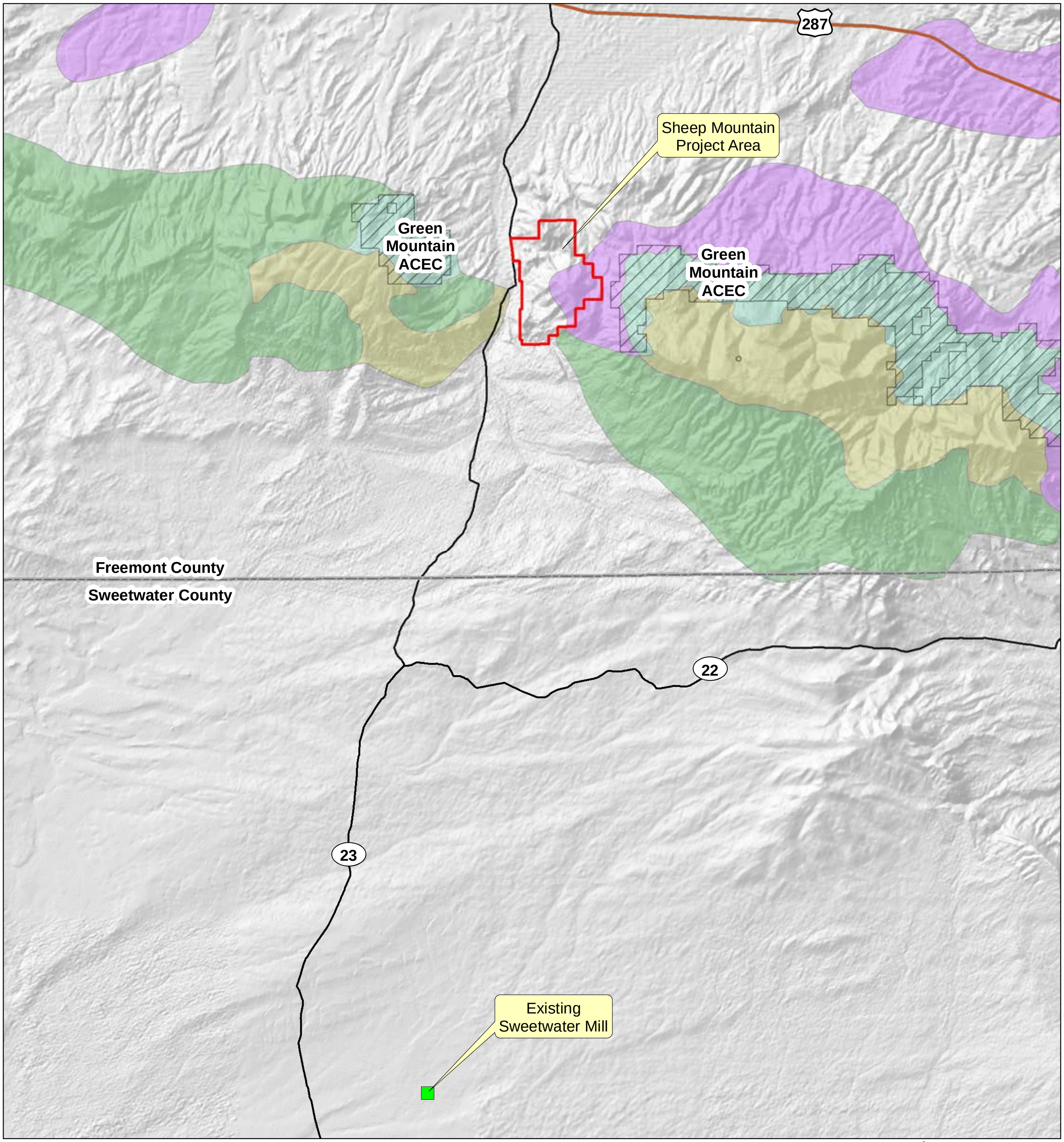
3.3.5.1 Big Game and Trophy Game

Four big game species occur within the Project Area: elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), and moose (*Alces alces*). Trophy game species potentially present include mountain lion (*Felis concolor*) and black bear (*Ursus americanus*). Data summarized below were compiled from WGFD Annual Big Game Herd Unit Reports from 1991 through 2014 and Annual Reports of Big Game and Trophy Game Harvest for the same period.

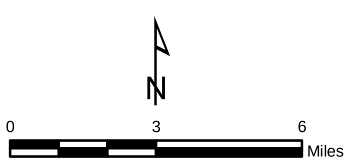
Elk within the Green Mountain Herd Unit (the local population area) inhabit winter range on the eastern third of the Project Area. The Green Mountain Herd Unit covers southeastern Fremont County, southwestern Natrona County, and small portions of adjoining Sweetwater and Carbon counties (see Map 3.3-4). Elk occupy winter range from November 15 through April 30. The remaining Project Area is not elk seasonal habitat. Crucial winter-yearlong range is 0.55 mile east of the Project Area boundary. Vehicle access to the Project Area on Crooks Gap/Wamsutter Road from US Highway 287 does not cross any seasonal habitats occupied by elk. Access from the south on the Crooks Gap/Wamsutter Road does not cross occupied habitat.

The Green Mountain elk population objective has been 500 animals since 1992 but the most recent estimated population for the herd unit was 1,400 elk in 2005. WGFD population estimates indicate the population had been increasing between 1991 and 2005. Harvest of cows and juveniles was reduced after the severe winter of 1992-1993. An average of 237 elk have been harvested annually within the Green Mountain Herd Unit during the past 20 years, 1995 to 2014 but annual harvest has been increasing, overall, during that period, including harvest of cows and calves.

Mule deer within the Sweetwater Herd Unit utilize different portions of the Project Area during different seasons: as winter-yearlong range in the southern two-thirds and as yearlong range in the northern third (see Map 3.3-5). Vehicle access to the Project Area on Crooks Gap/Wamsutter Road from US Highway 287 crosses a portion of yearlong habitat but mostly crosses unoccupied habitat for 5.6 miles. Access from the south on the Crooks Gap/Wamsutter Road crosses winter-yearlong habitat for 3.7 miles and yearlong habitat for 2.2 miles but most of the road crosses unoccupied habitats. According to WGFD herd unit maps, mule deer utilize Crooks Gap as a migration route from southern yearlong ranges to northern winter range in the vicinity of the Sweetwater River. The Sweetwater Herd Unit covers southeastern Fremont County, southwestern Natrona County, and small portions of adjoining Sweetwater and Carbon counties.



Map 3.3-4
Elk Seasonal Ranges



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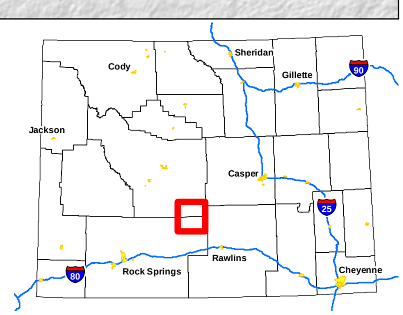
Sheep Mountain Project Area
Areas of Critical Environmental Concern
Crucial Winter Year Long
Winter
Spring-Summer-Fall
Winter Year Long

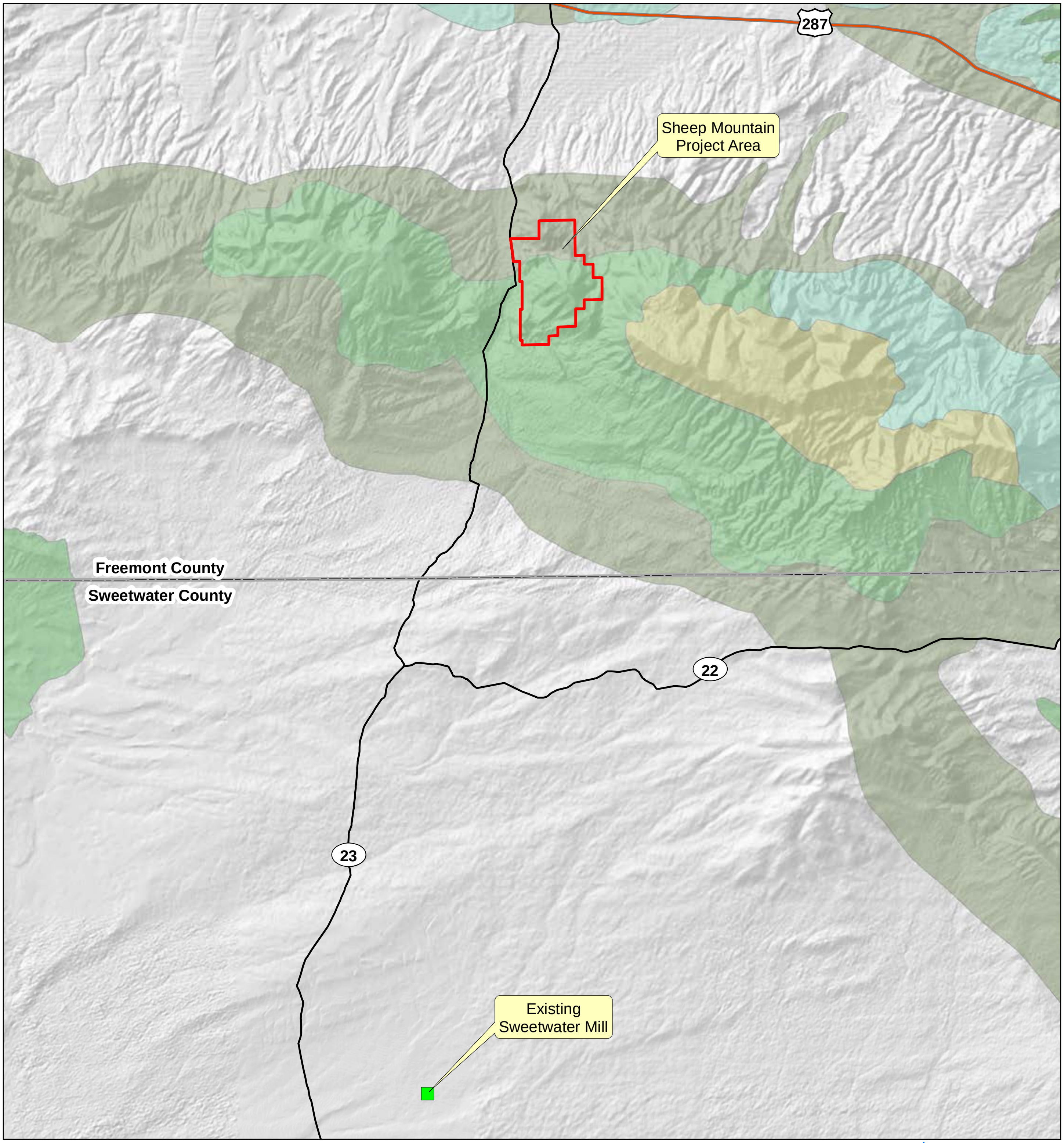
Data provided by Wyoming Game and Fish Department (Nov 2013)



The estimated post-harvest mule deer population has steadily increased during the past 15 years, 1997 to 2009, in large part due to an increasing trend in fawn recruitment with the 20-year average of 0.695 fawn per doe (69.5 fawns per 100 does). However, the population declined since 2010 with declining fawns per does until 2014 when 95.1 fawns per 100 does were documented. The estimated post-harvest population in the Sweetwater Herd Unit was 3,400 deer in 2014, above the previous year's estimate of 2,474. The recent population decline was attributed to drought conditions from winter 2011 through spring and summer 2012 (Harter, 2013a). The population objective is 6,000 deer. Harvests of does and fawns were eliminated when the population was reduced by severe winter conditions in 1992-1993. Harvest of bucks remained low until 2005; as the post-harvest population returned to the objective level, harvest of all sex and age groups (including harvest of does and fawns) increased through 2011 but decreased in 2012. The post-season ratio of 0.654 fawn per doe in 2012 was the lowest productivity reported for the herd unit since 2006 but productivity dramatically increased in 2014 with improved habitat conditions following consecutive years of drought.

Pronghorn occupying the northern half of the Project Area are within spring-summer-fall and winter-yearlong ranges in the Beaver Rim Herd Unit; pronghorn in the southern half occupy winter-yearlong range within the Red Desert Herd Unit (see Map 3.3-6). Vehicle access to the Project Area on Crooks Gap/Wamsutter Road, from US Highway 287, passes through crucial winter-yearlong habitat for pronghorns in the Beaver Rim Herd Unit habitat for approximately 3.7 miles. Access from the south, on Crooks Gap/Wamsutter Road, passes through winter-yearlong habitat with the exception of a 1-mile segment through crucial winter range near Interstate-80. According to WGFD herd unit maps, pronghorn in the Red Desert Herd Unit utilize Crooks Gap as a migration route to and from northern crucial winter-yearlong range to southern winter-yearlong habitats in the Great Divide Basin. The Beaver Rim Herd Unit covers most of southern Fremont County and southwestern Natrona County. The Red Desert Herd Unit is within northeastern Sweetwater County, extending to adjoining south Fremont County and northwest Carbon County.

The post-harvest population in the Beaver Rim Herd Unit has been below the objective of 25,000 animals (10 year average of 22,432 pronghorn) while the post-harvest population in the Red Desert Herd Unit has averaged 12,766 during the past 10 years, below the population objective of 15,000 pronghorn. Fawn production in both herd units had been slightly increasing during the past 20 years until 2012 when productivity in the Red Desert Herd Unit was the lowest on record since 1993 (0.417 fawn per doe) and the lowest since 1995 in the Beaver Rim Herd Unit (0.471 fawn per doe). Productivity in both populations increased through 2014 in response to improved habitat conditions and precipitation. The total pronghorn harvest in both herd units was dramatically reduced in 1995 following severe winters. Harvest has remained low in the Red Desert Herd Unit, averaging 550 since 1995 but pronghorn harvest has been increasing in the Beaver Rim population since 1995. Harvest was lower in 2012. Drought conditions through 2012, as described for mule deer, affected pronghorn productivity and population growth in both herd units but recent precipitation has led to improved habitat conditions with concomitant population responses.



Map 3.3-5
Mule Deer Seasonal Ranges

0 3 6
Miles

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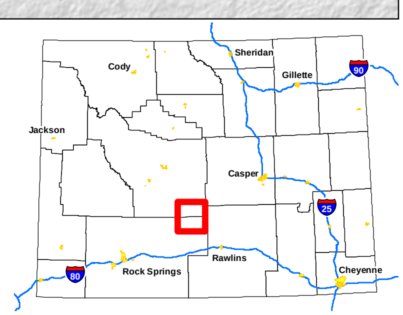
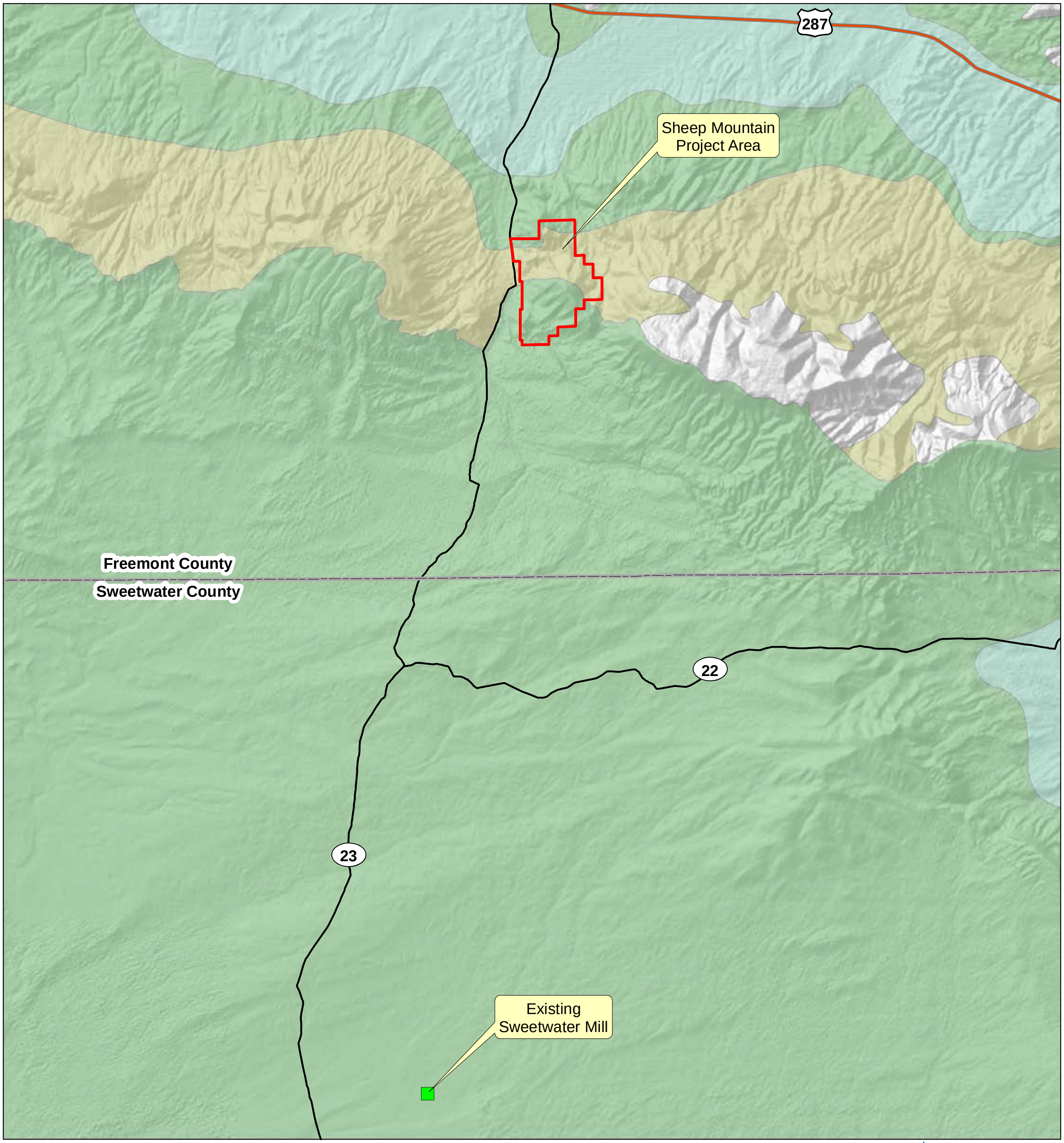
- Sheep Mountain Project Area
- Crucial Winter Year Long
- Spring-Summer-Fall
- Winter Year Long
- Year Long

Data provided by Wyoming Game and Fish Department (Nov 2013)





Map 3.3-6
Pronghorn Seasonal Ranges

N

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Miles

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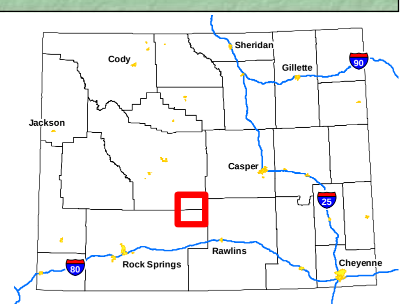
Sheep Mountain Project Area
Crucial Winter Year Long
Spring-Summer-Fall
Winter Year Long

Data provided by Wyoming Game and Fish Department (Nov 2013)



Moose in the Lander Herd Unit occupy spring-summer-fall range in the south and western portions of the Project Area (see Map 3.3-7). The Lander Herd Unit extends across southern Fremont Count and into southwestern Natrona County, extreme northwest Carbon County, northern Sweetwater County, and southeast Sublette County. The Lander Herd Unit post-harvest population objective was recently adjusted to 225 animals, the 2014 estimate was 113 moose. The population appeared to decline in 2005 and has remained below 400 animals through 2011 (no population estimate is available for 2012). Annual harvest has averaged 25 moose during the 20-year period, 1995 to 2014, although harvest has been reduced to bulls-only since 2005 due to the earlier population decline. The parasitic carotid artery worm (*Elaephora schneideri)* infects most moose populations throughout Wyoming but has not yet been found in the Lander Herd Unit (Harter, 2013b). Severe cases of winter ticks (*Dermacentor albipictus*) may be adversely affecting moose in this herd unit; ticks have adversely affected moose throughout their range in North America (Samuel et al., 2000).

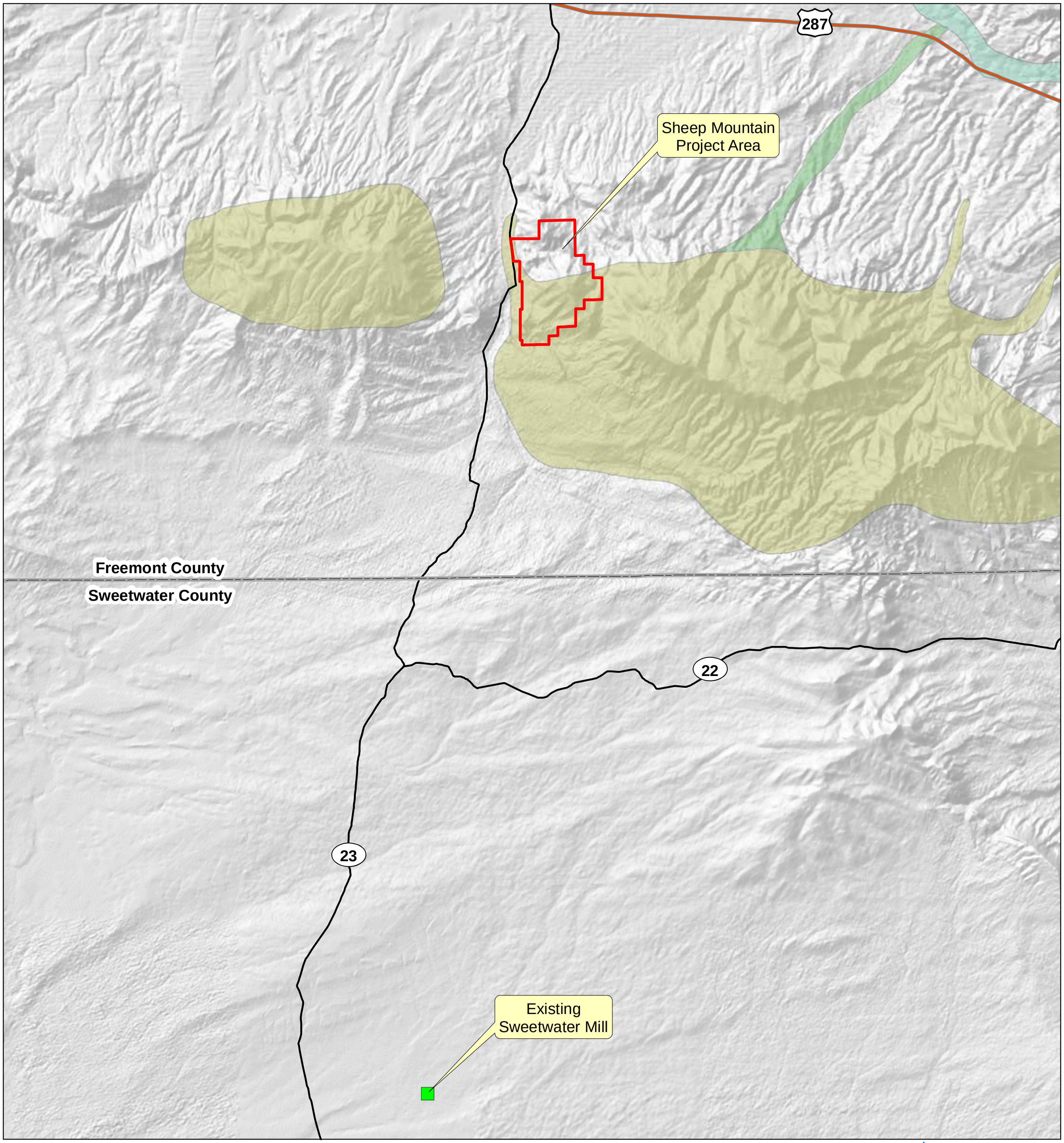
Mountain lions that could occur within the Project Area are within the Gas Hills Hunt Area. No population estimates are available. The WGFD has an annual harvest quota of six mountain lions for the hunt area but the quota has only been attained two times from 2006 to 2015.

Black bears may occur in the project vicinity but WGFD has not defined a management area for the species and there are no harvest data available for the region surrounding the Project Area. Black bears have been observed on Green Mountain in the past.

3.3.5.2 Upland Game Birds, Small Game and Furbearers

The Project Area coincides with two Small and Upland Game Management Areas (SUGMA 8 and 9) that were consolidated in 2010, along with four other areas, to form SUGMA 6. SUGMA 8 and 9 cover southern Fremont County, northern Sweetwater County, and adjacent areas in Natrona and Carbon counties. Seven upland game bird species have been harvested within SUGMA 8 and 9. Two of the species, mourning dove and ruffed grouse (*Bonasa umbellus*), were observed within the Project Area during 2010 (Real West, 2011) and the sagebrush-grassland habitat present is suitable for greater sage-grouse, also discussed as a Sensitive Species, above. Greater sage-grouse harvest data in Management Area E and Area H indicates there had been a significant declining trend in total birds harvested per hunter day from 2006 through 2014 (also see discussion in Section 3.3.4.3). Harvest data for mourning doves and ruffed grouse were consistently reported for SUGMA 8. From 2002 through 2014, fewer and fewer ruffed grouse had been harvested per hunter day, but harvest of mourning doves was consistent, averaging 3.8 birds per day. Those data were compiled from WGFD Small and Upland Game Annual Harvest Reports for 2001 through 2014. Blue grouse (*Dendragapus obsucrus*) have also been harvested in SUGMA 8 although their occurrence in the Project Area is unlikely, given the limited suitable habitat.

Harvest of rabbits, most likely desert cottontail (*Sylvilagus audubonii*), has been relatively consistent averaging 1.6 rabbits harvested per hunter day within SUGMA 8 and 9, combined (as SUGMA 6) from 2002 to 2014. Desert cottontails were observed within the Project Area during recent on-site surveys (Real West, 2011). Coyote (*Canis latrans*) is the only furbearer species observed in the Project Area although other furbearers including bobcat (*Lynx rufus*), badger (*Taxidea taxus*), weasels (*Mustella erminea* and *Mustela frenata*), and skunks (*Mephitis mephitis* and *Spilogale putorius*) are expected, given the habitats present within the Project Area. Aquatic-dependent furbearers - beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), or mink (*Mustella vison*) - potentially occur in Crooks Creek, approximately 0.25 mile west of the Project Area.



Map 3.3-7
Moose Seasonal Ranges

0 3 6
Miles

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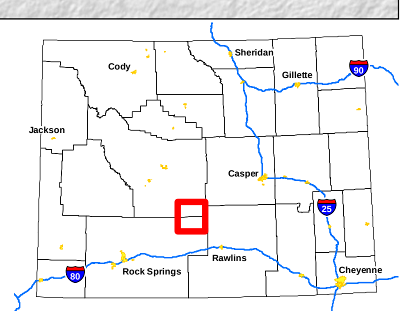
Sheep Mountain Project Area
Crucial Winter Year Long
Spring-Summer-Fall
Winter Year Long

Data provided by Wyoming Game and Fish Department (Nov 2013)



3.3.5.3 Migratory Game Birds

Migratory game birds (including waterfowl) are protected under the MBTA of 1918, discussed above. The Project Area is within Waterfowl Management Area (WMA) 4D which coincides with the Central Flyway, east of the Continental Divide in Wyoming. Very few ducks and geese are harvested in WMA 4D compared to other management areas within the Central Flyway. Habitat for waterfowl within the Project Area is limited to McIntosh Pit and Western Nuclear Pond (Real West, 2011). A few Canada geese (*Branta canadensis*) were observed at McIntosh Pit during spring, 2010. There is no emergent vegetation or riparian vegetation in the pit and water is alkaline (pH > 7). Selenium concentrations exceed 2 µg/l. Selenium concentrations in water (>2 µg/l) are considered toxic to vertebrates, including waterfowl (Peterson and Nebeker, 1992; Lemly, 1996; Bureau of Reclamation et al., 1998). Green-winged teal (*Anas carolinensis*) and common mergansers (*Mergus merganser*) were seen on Western Nuclear Pond, which is likely utilized by other waterfowl as well (Real West, 2011).

3.3.5.4 Non-Game Wildlife

Wildlife surveys within the Project Area were conducted in April 1974. Results from that survey were augmented by observations from a study conducted by the WGFD in south central Wyoming during 1980 in habitats similar to those in the Project Area (see Real West, 2011). As stated (Real West, 2011), it was “assumed that the animal density information for vegetation types in southwest Wyoming can be extrapolated to similar vegetation types in the Crooks Gap Area.” The information from those studies, along with surveys conducted in 2010 and 2011, suggested that various nongame wildlife (not including game species or Special Status Species) might be found in habitats within or adjacent to the Project Area including 32 species of mammals and 133 species of birds, all of them migratory species protected under the MBTA (see above). In addition, WGFD (2009) reported two species of lizards, three species of snakes, one salamander and three frog species (one of them a Special Status Species) that have been observed within the region surrounding the Project Area. Northern leopard frog (*Rana pipiens*) and boreal chorus frogs (*Pseudacris maculata*) occur in Crooks Creek, approximately 0.25 mile west of the Project Area and chorus frogs inhabit Western Nuclear Pond (Real West, 2011).

3.3.5.5 Fisheries

Noted above, water impounded in McIntosh Pit is likely to be unsuitable for fish and other aquatic organisms due to the presence of selenium and absence of aquatic vegetation. However, the WGFD have stocked Western Nuclear Pond with brook trout (*Salvelineus fontinalis*) and rainbow trout (*Onchorhynchus mykiss*) annually since 1990. The WGFD stocked the pond with largemouth bass (*Micropterus salmoides*) in 2011. Sampling was conducted in June 2013 which yielded brook trout, largemouth bass, rainbow trout, white suckers (*Catostomus commersonii*), and fathead minnows (*Pimephales promelas*) that were probably introduced by the public (Real West, 2013).

The reservoir is on private land inside the southern boundary of the Project Area but has been accessible to the public and is managed as a basic yield fishery (see Appendix B in Real West, 2011). Also, native fish species occur in Crooks Creek, a tributary to the Sweetwater River with intermittent flows between Crooks Gap and the river. Creek chub (*Semotilus atromaculatus*), long nosed dace (*Rhinichthys cataractae*) and white sucker have been found in the creek in the vicinity of Crooks Gap, west of the Project Area, along with non-native brook trout (Real West, 2011). Crooks Creek is classified by the WGFD as a Class 3 trout stream, an important regional fishery in the state (BLM, 2013a).

3.3.6 Wild Horse and Burros

The BLM protects, manages, and controls wild horses and burros under the authority of the Wild Free-Roaming Horses and Burros Act of 1971. This law ensures that healthy herds thrive on healthy rangelands. Most wild horses in the nation are found on BLM-administered lands. The BLM is responsible for managing the size and distribution of the herds. While wild horses (there are no free-roaming burros in the Lander area) are of particular interest to the public, wild horses compete with other grazing species for forage within their range.

The BLM designated wild horse herd areas, carried forward without modification in the 2013 RMP (BLM, 2013a) with approximately 1,000 horses in seven herd management areas (HMAs). Population numbers (called HMA Appropriate Management Levels) are in accordance with the 2003 Consent Decree in litigation brought by the State of Wyoming against the BLM. The Decree was valid for 10 years and is set to terminate in 2013. Additional information regarding the wild horse program in the LFO can be found in the FEIS for the Lander RMP (BLM, 2013a).

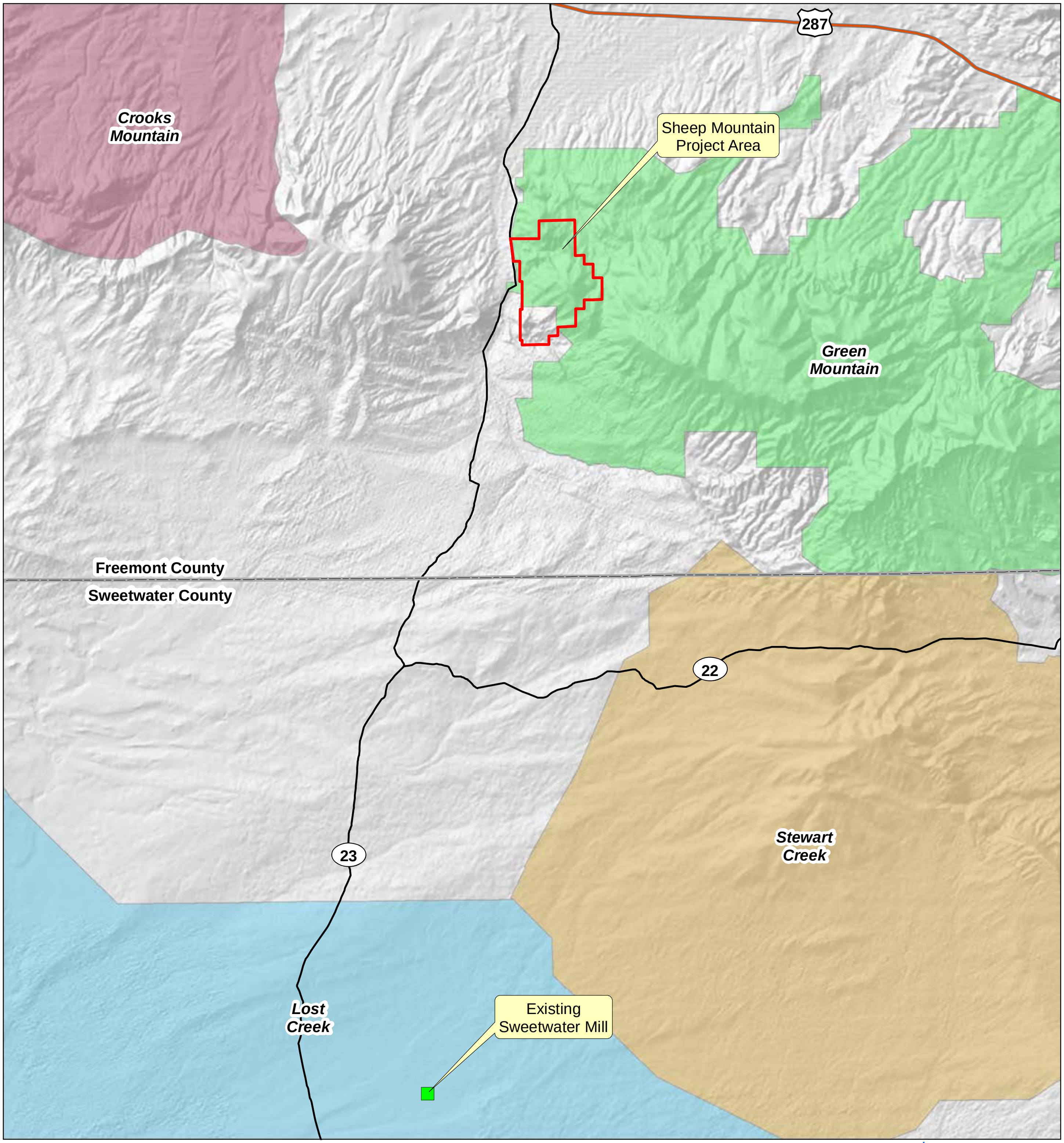
The Green Mountain HMA (116,680 acres of which 99,231 acres are federal surface) coincides with 2,932 acres of the Project Area (see Map 3.3-8). The Green Mountain HMA Appropriate Management Level is 170 to 300 horses, and the current number of horses within the HMA is estimated to be 456 (Fluer, 2013). Crooks Mountain HMA, about 5.7 miles to the west of the Project Area, consists of 58,425 acres of which 54,726 acres are federal surface. The Appropriate Management Level for this herd management area is 65 to 100 horses, and the current number of horses within the HMA is estimated to be 167 (Fluer, 2013).

Wild horses graze on the range throughout the year. The BLM uses an animal unit month (AUM) of 1.15 for horses (as compared to 1 AUM for a cow/calf for domestic livestock). With few natural predators, wild horses have a reproduction rate of approximately 20 percent per annum in typical weather years (in times of drought and other types of severe weather, this rate may be lower). There is some limited predation of the Crooks and Green Mountain HMAs by mountain lions.

Population control within the range of HMA Appropriate Management Level is maintained by periodic gathers in which the health of the population is assessed and animals removed as needed to maintain the Appropriate Management Level. Fertility control is administered to the mares by anti-fertility drugs. In the past, this has been most often the vaccine Porcine Zona Pellocida, which has declining effectiveness over time. By the fourth year following injection, the drug has only limited utility.

Table 3.3-5 identifies the wild horse removals from the Green Mountain and Crooks Mountain HMAs since 1980.

Indicators of health for wild horses can be broken down into two main areas: the health of the horses and the vegetative health of the habitat in which they live. Each is a reflection of the other. Wild horses are adversely impacted by the loss or degradation of vegetation in their habitat. While wild horses have adapted to avoid humans and generally spend their time loafing and grazing on higher ground to facilitate surveillance of the surrounding areas, they do visit riparian areas for water and to consume riparian vegetation which during the hotter months is more palatable than upland vegetation.



Map 3.3-8
Green Mountain Herd Management Area

N

0 3 6 Miles

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Sheep Mountain Project Area

Herd Management Areas

Crooks Mountain
Lost Creek
Green Mountain
Stewart Creek

Data provided by Bureau of Land Management,
Lander Field Office (Aug 2010)

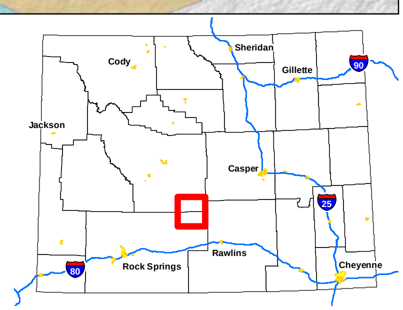


Table 3.3-5
Wild Horse Removals from the Green Mountain and Crooks Mountain HMAs since 1980

Year	Numbers Removed
Green Mountain HMA	
1980	255
1984	199
1993	318
1995	88
1996	105
1997	145
2002	155
2003	75
2005	490
2006	89
2009	330
2012	240
Crooks Mountain HMA	
1985	708
1996	319
1998	220
2002	103
2006	74
2009	0
2012	17

Wild horses are adversely impacted by fences; even when the horizontal fence rails are removed to facilitate wildlife movement, wild horses will avoid the vertical fence posts as if movement were still blocked.

Wild horses move outside of the HMAs where topography and fencing allow which supports genetic intermingling between the Crooks Mountain HMA and Green Mountain HMA herds as well as with other HMAs. Wild horses also migrate from winter protection areas to other locations for parturition and summer grazing.

Wild horse-vehicle collisions are relatively rare. The BLM does not have any recorded incidences of wild horse harassment by humans.

3.4 HERITAGE RESOURCES AND HUMAN ENVIRONMENT

3.4.1 Cultural Resources

The BLM manages cultural resources on public lands in accordance with the Antiquities Act of 1906, National Historic Preservation Act (NHPA) of 1966, Native American Graves Protection and Repatriation Act of 1990, the Archaeological Resources Protection Act of 1979, and various other laws and Executive Orders. The BLM also implements the procedures identified in Wyoming BLM's 2006 Protocol with the State Historic Preservation Officer (SHPO), as part of the BLM's National Programmatic Agreement with the Advisory Council on Historic Preservation.

Cultural resources span approximately 11,500 years in the Rocky Mountain west (BLM, 2011b). The region encompassing the Project Area contains prehistoric and historic sites and traditional cultural places. Examples of known cultural resources in the area include, but are not limited to, lithic scatters, camps, trails, and a stage station.

LTA, Inc. (LTA) conducted a files search at the Wyoming Cultural Records Office and included National Register of Historic Places (NRHP) listings and General Land Office plats. The NRHP is an official federal list of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture. National Register properties have significance to the history of their community, state, or the nation. The files search encompassed approximately 11 square miles, covering all public lands survey sections containing the Project Area (Sections 15, 16, 17, 20, 21, 22, 27, 28, 29, 32, and 33). The search indicated a fairly high density of prehistoric materials along and parallel to the major drainages that border Sheep Mountain, including Crooks Creek to the west and Sheep Creek to the east. The findings also show six previous cultural resource inventories, including approximately 1,570 acres in the vicinity of the Project Area. Nearly all of this land is within the Project Area. Twenty-three sites have been recorded in or within the vicinity of the Project Area. Previously recorded sites within the vicinity of the Area of Potential Effect (APE) are summarized in Table 3.4-1. Two of these sites, 48FR80 and 48FR256, are within the Project Area. Site 48FR256 consists of prehistoric hearth remains discovered adjacent to the Crooks Gap/Wamsutter Road. The site is listed in the Cultural Records Office database as destroyed. Site 48FR80 is marked as a stone circle site but field visits confirmed it to be only natural features.

There are seven previously recorded historic properties within the vicinity of the Project Area that have been determined eligible for inclusion in the NRHP with Wyoming SHPO concurrence. An eighth site, 48FR1864, was evaluated by the recorder as eligible. None of these sites are within the Project Area. An additional site, recorded in 2013, is within the Project Area boundary (48FR7357, described below) and was recently determined to be ineligible for inclusion in the NRHP. All of the sites are described in full detail in the 2010 and 2013 cultural survey reports (Larson, 2010 and Larson and Hooten, 2013), which also includes a list of previous cultural surveys in the area. Two of the eligible sites, the Rawlins to Fort Washakie Road (48FR415), and the Crooks Gap Stage Station (48FR1435), are historic era resources. The historic-era is usually defined as beginning with the first contact between Euro-Americans and Native Americas. The end of the historic era is fluid and generally defined as at least 50 years old. The two sites were the subjects of visual contrast assessments, which are also described below.

LTA also engaged in three separate Class III surveys on approximately 81.5 acres (Larson, 2010), 121 acres (Eckles and Larson, 2011), and 168 acres (Larson and Hooten, 2013) within and adjacent to the Project Area. The inventory areas were inspected on foot with field personnel spaced no more than 30 meters apart. No forms of artifact collection or subsurface testing took place. The selection of inventory areas and other matters related to the cultural resource investigations are the result of LTA correspondence with the BLM LFO's cultural resource staff and subsequent meetings. A total of 11 Class III cultural resource inventories have been conducted within the WDEQ-LQD Permit to Mine 381C Permit Area and/or along the linear utility and dewatering lines leading into the area since 1979.

In 2014, an additional 92.2 acres were inventoried for cultural resources by LTA (Larson, 2014). These cover areas of proposed project disturbance were not examined for cultural resources under the previous inventories within the Project Area. These new acres include 46.8 acres of BLM-administered land and 45.4 acres of state land, and bring the total acres inventoried for this Proposed Action to 462.7 acres. The 2014 inventory recorded only one isolated find and determined that there is very little chance subsurface materials are present in the area (Larson, 2014).

Table 3.4-1
Previously Recorded Sites in the Vicinity of the Proposed Action APE

Site Number	Site Type	NRHP Eligibility
48FR80	Stone Circles (Natural Features)	Not Eligible
48FR256	Fire Hearth	Destroyed
48FR415	Rawlins to Fort Washakie Trail	Eligible, contributing (Segments 2 and 4) and noncontributing segments recorded
48FR1356	Crooks Gap Oil Field	Not Eligible
48FR1435	Crooks Gap Stage Station	Eligible
48FR1470	Prehistoric Lithic Scatter	Not Eligible
48FR1471	Prehistoric Lithic Scatter	Not Eligible
48FR1476	Prehistoric Lithic Scatter	Not Eligible
48FR1864	Prehistoric Feature, Fire Hearths	Eligible
48FR2641	Prehistoric Lithic Scatter	Not Eligible
48FR3293	Prehistoric Lithics, Fire Hearths	Eligible
48FR3503	Prehistoric Lithic Scatter	Not Eligible
48FR4221	Prehistoric Lithics, Fire Hearths	Eligible
48FR4222	Prehistoric Lithics, Fire Hearths	Not Eligible
48FR4223	Prehistoric Lithics, Fire Hearths	Not Eligible
48FR5123	Prehistoric Lithics, Fire Hearths	Not Eligible
48FR5124	Prehistoric Lithics, Fire Hearths	Not Eligible
48FR5125	Prehistoric Lithics, Fire Hearths	Eligible
48FR6259	Prehistoric Feature, Fire Hearths	Unknown
48FR6260	Prehistoric Lithics, Fire Hearths	Eligible
48FR6261	Prehistoric Feature, Fire Hearths	Eligible
48FR6262	Prehistoric Lithics, Fire Hearths	Not Eligible
48FR6496	Prehistoric Lithic Scatter, Historic Debris	Not Eligible

The field search for the previously recorded archaeological site 48FR80 was unsuccessful. BLM personnel also attempted to relocate the stone circle 48FR80 and found what appears to be the original site datum. However, no stone circles or other cultural materials were found and only natural rocks and boulders occur in the reported vicinity of the site. As a result, this site is now considered not eligible for listing on the NRHP.

Site 48FR7357 is within an area of proposed potential disturbance west of the proposed processing facility. This site is thought to be the Continental Materials Corporation mine camp and office area. Wyoming SHPO recently determined that the site is not considered to be eligible for inclusion on the NRHP and that the proposed mining operations would have no effect on the site. It is one of the few, if not only, surviving mine camps from the early 1954 to 1957 phase of exploration and small-scale mining in the Sheep Mountain/Crooks Gap area. While the structural remains at 48FR7357 are relatively common utilitarian designs with little or no architectural merit, the foundations are well preserved.

The historical Rawlins to Fort Washakie Road is eligible for listing on the NRHP. Two contributing segments (meaning, that the segments each contribute attributes that make the road NRHP eligible) of the road (48FR415-2 and 48FR415-4) are located north of the Crooks Gap area, within 0.25 miles of the Project Area. These segments exhibit good structural integrity and for the most part are free of direct modern disturbance (Larson, 2010). Other segments nearby are non-contributing. The Project Area is visible from both contributing segments, but the

BLM determined that setting is no longer an aspect of the site's integrity due to extensive modern intrusions through Crooks Gap (e.g., roads, pipelines, power lines, and mines).

The Crooks Gap Stage Station (48FR1435), also eligible for NRHP listing, is on the west bank of Crooks Creek about 0.5 miles west of the Project Area. Similar to the contributing segments described above, setting is no longer an aspect of the site's integrity due to modern intrusions in the area.

Five segments of the Oregon Trail's southern "Military Route" (48FR736) are located approximately 8 miles north of the Project Area. The Oregon Trail in Wyoming is a NRHP eligible property.

3.4.2 Paleontological Resources

Paleontological resources include any fossilized remains, traces, or imprints of organisms, preserved in or on the earth's crust, that are of paleontological interest and that provide information about the history of the life on earth. The BLM manages paleontological resources for their scientific, educational, and recreational values in compliance with the FLPMA, the NEPA, and the Paleontological Resources Preservation Act (PRPA) of 2009. The PRPA affirms the authority for many policies BLM already had in place to manage paleontologic resources, such as issuing permits for collecting paleontologic resources, curation of resources, and the need for confidentiality of locality data. The PRPA law also defines prohibited acts, such as damaging or defacing resources, and establishes both criminal and civil penalties for those acts.

Stratigraphic rex, LLC (SR) conducted a pedestrian paleontological survey at the Sheep Mountain Mine on more than 4,000 acres of BLM, state, and private land (Connely, 2011). SR also completed a literature search to determine known existing paleontologic resource locations in the area, and examined aerial photographs to identify exposed outcrops prior to field work. The literature review did not locate fossil remains in the area.

The survey area contains five major stratigraphic units, including alluvial and colluvial deposits, Crooks Gap Conglomerate, Tertiary Battle Spring Formation (lower and upper members), Fort Union Formation, and Cody Shale (see Section 3.2.2, Geologic Resources). The Project Area has approximately 439 acres of disturbed surface from previous mining activity, and about 892 acres of reclaimed land. Unaltered areas are covered with native vegetation. The majority of the area contains outcrops of the Battle Spring Formation and Crooks Gap Conglomerate. These high-energy sedimentary formations are not particularly conducive to preserving vertebrate or significant invertebrate and plant fossils. Outcrop inspection did not reveal any macro fossil evidence.

The Fort Union and Cody Shale formations are known to host vertebrate fossil remains; however, these finds tend to be sporadic and with low concentration. The Fort Union Formation and Cody Shale are located in the northeast portion of the Project Area. Inspection of this area did not reveal any fossil evidence. The Fort Union Formation has yielded vertebrate fossils in very high concentrations elsewhere in the state (southwestern corner).

The five major formations within the Project Area are Class 3 in the Potential Fossil Yield Classification (PFYC). Formations of Class 3 potential are fossiliferous units where fossil content varies broadly in significance and abundance; which triggered the above described surveys. The Quaternary sediments mapped within the Project Area are PFYC Class 2 or low potential.

3.4.3 Tribal and Native American Religious Concerns

On September 5, 2012, the BLM and tribal representatives visited the Sheep Mountain Project Area. The purpose of the tour was to show tribal representatives the Project Area and elicit comments about the Project and sites of religious or cultural significance that may be in the area. A total of six tribes were contacted via letter, email, and phone calls to see if they wanted to send representatives to the field tour. Of the six tribes, two sent representatives to participate in the September 5, 2012 field tour.

No known archaeological sites were located in the Project Area from past surveying, so none were visited during the field tour, but the field tour looked at two nearby sites: the Crooks Gap Stage Station and an intact segment of the Rawlins to Fort Washakie Road. No tribal or Native American religious concerns were identified during tribal consultation.

3.4.4 Socioeconomics

The Sheep Mountain Project Area is located in southeastern Fremont County, approximately 60 miles southeast of Lander, 62 miles southeast of Riverton, 65 miles northwest of Rawlins, and 105 miles southwest of Casper. The area is characterized by livestock grazing and extensive uranium development that occurred in the 1970s, 1980s, and part of the 1990s. Several oil and gas fields are also present in the area (see Map 3.2-6). The closest communities are Jeffrey City (8 miles) and Bairoil (16 miles), which have limited services and amenities. Impacts to Jeffrey City could occur, depending on temporary or permanent housing that could be potentially developed in the area. Lander and Riverton, in Fremont County, and Rawlins, in Carbon County, are the larger communities most likely to be affected by the Proposed Action. Therefore, the affected environment for socioeconomic impacts associated with mining and milling in the Project Area includes Fremont and Carbon counties.

Fremont County follows Sweetwater County as Wyoming's second largest county, covering 9,183 square miles. The county's geographic variety highlights its economic diversity. In the western portion of the county, the Wind River Mountains support tourism, with outdoor-based recreation activities centered in Lander and Dubois. The Wind River Indian Reservation, home to approximately 2,500 Shoshone Indians and 5,000 Northern Arapahoe Indians, lies in the central portion of the county (Wind River Visitors Council, 2013). The nearest reservation boundary is approximately 60 miles northwest of the Project Area. Because of the reservation's distance from the Project Area, this document does not describe socioeconomic conditions on the reservation as distinct from those for Fremont County as a whole. Feed crops, particularly alfalfa and sugar beets, are grown in irrigated fields surrounding Riverton. Oil and gas production in the eastern portion of the county largely centers around the towns of Lysite, Shoshone, and Pavilion and makes a substantial contribution to the county's growing mineral development industries. The oil and gas industry contributes by far the largest percentage of revenue to the national, state, and local governments of any industry (BLM, 2011b). Oil and gas activities in the Bairoil and Jeffrey City areas, while smaller than development in other parts of the county, have strong impacts to those communities.

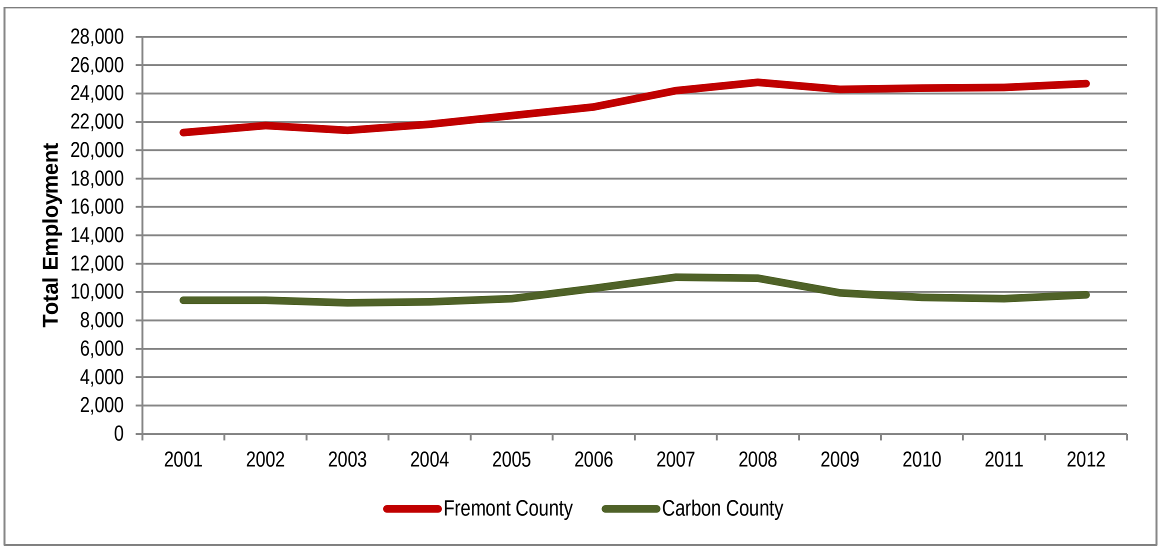
Fremont County ranks second in Wyoming for total uranium production, with over 100 million pounds of uranium produced since mining began in the 1950s. There has been little uranium mining activity in Fremont County since the market for uranium collapsed in the 1980s. The last production at the Sheep Mountain Mine occurred in 1985 (BLM, 2011b). Although several entities are pursuing uranium development opportunities, there was no uranium mining in Fremont County as of early 2014.

With 7,897 square miles, Carbon County is the third largest county in Wyoming. The Project Area is near the county's northwest corner. Development patterns in Carbon County originally followed the Union Pacific railroad tracks, and most of the county's population lives near the Interstate-80 corridor in the central portion of the county. Mineral development includes coal mining near Hanna and oil and gas production in the western and northeastern portions of the county. Medicine Bow National Forest and the North Platte River support tourism and hunting and fishing in southern Carbon County. Rawlins is the county's largest community, the county seat, and the site of the Wyoming State Penitentiary.

3.4.4.1 Economic Conditions

Primary employment sectors include education, health care, accommodations and food services, and retail establishments. Government employment is also prominent in both counties, due in large part to the sizeable tracts of public land (public land covers 86 percent of Fremont County and 61 percent of Carbon County), and the counties' large sizes and dispersed populations.

Employment. Fremont County has a larger employment base than Carbon County. Between 2001 and 2012, total employment in Fremont County ranged from a low of 21,243 jobs in 2001 to a high of 24,782 jobs in 2008, and included 24,688 jobs in 2012 (see Figure 3.4-1). Between 2001 and 2012, total employment in Carbon County ranged from a low of 9,247 jobs in 2003 to a high of 11,036 jobs in 2007, and included 9,808 jobs in 2012 (Bureau of Economic Analysis - BEA, 2014a). Over the past decade, employment in Fremont County has been more stable during national economic downturns than employment in Carbon County. Between 2001 and 2007, employment increased nearly 14 percent in Fremont County and 17 percent in Carbon County. Following the economic recession of 2008, employment in Fremont County increased 2 percent between 2007 and 2012, while employment in Carbon County decreased 11 percent during this period.



[1] **Source: BEA, 2014a.**

Figure 3.4-1
Total Full and Part-Time Employment, Fremont and Carbon Counties, 2001 – 2012[1]

Employment by Industry. The compositions of each county's economy during this period, in terms of covered (wage) employment, which excludes proprietors (self-employed workers) and farm workers, are shown in Tables 3.4-2 and 3.4-3. Education and health services, retail trade, public administration, and accommodations and food services are the largest sources of employment in Fremont County (see Table 3.4-2). Combined, these sectors account for approximately 57 percent of wage employment in the county. Between 2001 and 2012, wage employment in Fremont County increased nearly 17 percent. Nearly all of the job growth occurred before 2008; between 2008 and 2012 the number of wage and salary workers in the county only increased by 2 percent. Between 2001 and 2012, most new jobs were created in the Education and Health Services (702 new jobs), Mining (649 new jobs), and Public

Administration (312 new jobs) sectors. The oil and gas industry accounted for nearly all new jobs in the Mining sector.

Table 3.4-2
Employment by Industry: Fremont County, 2001, 2008 and 2012[1,2]

Industrial Sector	2001		2008		2012	
	Average Annual Employment	Average Annual Wages	Average Annual Employment	Average Annual Wages	Average Annual Employment	Average Annual Wages
Ag., Forestry, Fishing, Hunting	102	$19,046	131	$20,253	143	$23,713
Mining	310	$41,669	822	$68,379	959	$82,018
Utilities	--	--	--	--	91	$61,560
Construction	1,378	$31,788	1,189	$36,134	988	$41,967
Manufacturing	476	$24,453	423	$31,667	235	$37,881
Wholesale Trade	--	--	--	--	384	$40,417
Retail Trade	1,939	$19,163	2,100	$24,520	1,881	$27,321
Transportation & Warehousing	448	$33,306	478	$47,008	431	$45,889
Information	271	$21,709	262	$30,428	208	$35,024
Finance & Insurance	268	$29,819	331	$38,815	323	$43,724
Real Estate, Rental & Leasing	181	$20,332	396	$39,340	362	$48,456
Professional & Technical Services	365	$27,909	484	$51,187	541	$52,691
Mgmt of Companies & Enterprises	--	--	15	$112,454	11	$176,909
Administrative & Waste Services	--	--	185	$34,252	200	$35,675
Education & Health Services[3]	3,788	$24,284	4110	$37,284	4,490	$38,353
Arts, Entertainment, Recreation	91	$10,057	118	$12,803	130	$11,892
Accommodation & Food Services	1,390	$9,582	1,481	$13,108	1,480	$14,858
Other Services	--	--	--	--	483	$30,019
Public Administration[4]	1,422	$26,371	1,685	$37,125	1,734	$44,844
Total Employment by Industry	14,396	$23,899	16,643	$34,864	16,802	$39,086

[1] Source: BLS, 2014a.
[2] Excludes proprietors and farm employment and earnings.
[3] Includes school district employees.
[4] Includes federal, state, and local government employment.

Between 2001 and 2012, wages in Fremont County increased most rapidly in the Real Estate, Rental and Leasing, Professional and Technical Services, and Mining sectors. In 2012, average annual wages in Fremont County varied from highs of $176,909 in Management of Companies and Enterprises and $82,018 in Mining to lows of $14,858 in Accommodations & Food Services and $11,892 in Arts, Entertainment & Recreation (Bureau of Labor Statistics - BLS, 2014a).

Education and health services, public administration, accommodations and food services, and retail trade are also the largest sources of wage employment in Carbon County (see Table 3.4-3). Combined, these sectors account for approximately 59 percent of the county's wage employment. Between 2001 and 2008, wage employment in Carbon County increased 22 percent, due largely to job growth in the Mining and Construction sectors. Many of these jobs have been lost since 2008; wage employment in Carbon County fell nearly 11 percent between 2008 and 2012, for an overall job growth rate of 9 percent between 2001 and 2012.

Between 2001 and 2012, wages in Carbon County increased most rapidly in the Mining and Transportation and Warehousing sectors. In 2012, average annual wages varied from highs of $79,339 in Mining and $63,246 in Utilities to lows of $22,956 in Arts, Entertainment and Recreation and $17,546 in Accommodations and Food Services (BLS, 2014a).

Table 3.4-3
Employment by Industry: Carbon County, 2001, 2008 and 2012[1,2]

	2001		2008		2011	
Industrial Sector	**Average Annual Employment**	**Average Annual Wage**	**Average Annual Employment**	**Average Annual Wage**	**Average Annual Employment**	**Average Annual Wage**
Ag., Forestry, Fishing, Hunting	226	$19,307	--	--	167	$34,707
Mining	164	$42,840	455	$63,733	251	$79,339
Utilities	37	$43,019	57	$49,009	57	$63,246
Construction	401	$28,491	1,102	$64,282	524	$49,595
Manufacturing	490	$42,450	--	--	--	--
Wholesale Trade	126	$34,606	73	$45,085	64	$41,250
Retail Trade	722	$16,767	808	$24,770	685	$27,905
Transportation & Warehousing	178	$28,820	305	$51,500	300	$53,447
Information	75	$19,449	79	$28,833	84	$28,036
Finance & Insurance	111	$30,230	148	$37,014	135	$39,474
Real Estate, Rental & Leasing	69	$11,636	91	$18,598	82	$27,744
Professional & Technical Services	118	$24,149	168	$67,022	152	$69,770
Mgmt of Companies & Enterprises	--	--	18	$46,931	19	$59,947
Administrative & Waste Services	--	--	121	$35,462	116	$32,129
Education & Health Services[3]	1,196	$25,013	1,211	$37,422	1,284	$37,382
Arts, Entertainment, Recreation	87	$19,600	78	$25,835	90	$22,956
Accommodations & Food Services	804	$9,959	961	$14,588	957	$17,546
Other Services	159	$18,719	165	$27,899	139	$26,705
Public Administration[4]	1,043	$32,614	1,158	$41,762	1,136	$45,870
Total Employment by Industry	6,302	$24,823	7,698	$41,243	6,873	$41,550

[1] Source: BLS, 2014a.
[2] Excludes proprietors and farm employment and earnings.
[3] Includes school district employees.
[4] Includes federal, state, and local government employment.

Agriculture. Farming and ranching make notable contributions to employment in Fremont and Carbon counties. Between 2001 and 2012, farming (including ranching) accounted for an average of 11 percent of total employment in Fremont County and an average of 6 percent of total employment in Carbon County (BEA, 2014a). In 2012, farm employment (labor and proprietors) in Fremont County included 2,717 workers, and the average farm income was $7,814. In that year, farming employed 609 workers in Carbon County, and the average farm income was $13,856 (see Table 3.4-4).

In 2012, Fremont County ranked second in the state based on the value of livestock inventories and crop production, and Carbon County ranked sixth (USDA, 2014a). In that year, Fremont County ranches and farms reported total sales of nearly $102.5 million in agricultural products, and ranches and farms in Carbon County reported total agricultural sales of approximately $78.6 million. In both counties, cattle and calves account for the majority of livestock inventories, followed by sheep and lambs. Major crop production in Fremont County includes hay, corn for grain and sileage, dry edible beans, barley, and sugar beets. Crop production in Carbon County consists primarily of hay production (USDA, 2014b).

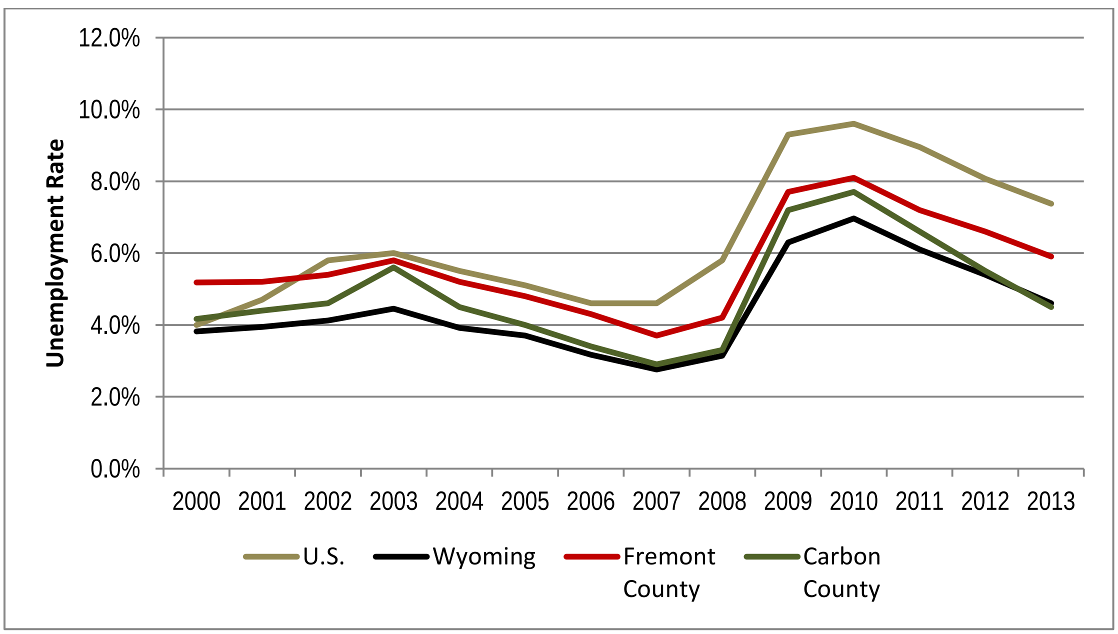
Table 3.4-4 provides an overview of farming trends in Fremont and Carbon counties. Along with the upward trends in employment and market values for agricultural output in Fremont County, farming is becoming more intensive in that county. The portion of Fremont County covered by farmland decreased from nearly 43 percent in 2002 to 29 percent in 2012. Farming in Carbon County is more reliant on livestock production, and the portion of the county covered by farmland remained relatively stable between 2002 (46 percent) and 2012 (47 percent).

Table 3.4-4
Overview of Agriculture in Fremont and Carbon Counties, 2002 and 2012

Economic Measure	Fremont County		Carbon County	
	2002[1]	2012[2]	2002[1]	2012[2]
Total farm employment[3]	2,359	2,717	782	609
Average farm income[3]	$1,756	$7,814	$5,733	$13,856
Number of farms	1,049	1,363	290	319
Land in farms (acres)	2,503,853	1,710,015	2,329,571	2,374,154
Farm land as percent of county area	42.6%	29.1%	46.1%	47.0%
Market value of agricultural products sold	$59,854,000	$102,482,000	$43,142,000	$78,578,000
Livestock	$44,916,000	$51,496,000	$42,094,000	$67,358,000
Crops	$14,938,000	$50,986,000	$1,048,000	$11,219,000
Farm operators with farming as principal operation				
Number of operators	579	749	191	192
Percent of all farm operators	56.8%	55.0%	65.9%	60.2%

[1] USDA, 2002.
[2] USDA, 2014b.
[3] BEA, 2014a.

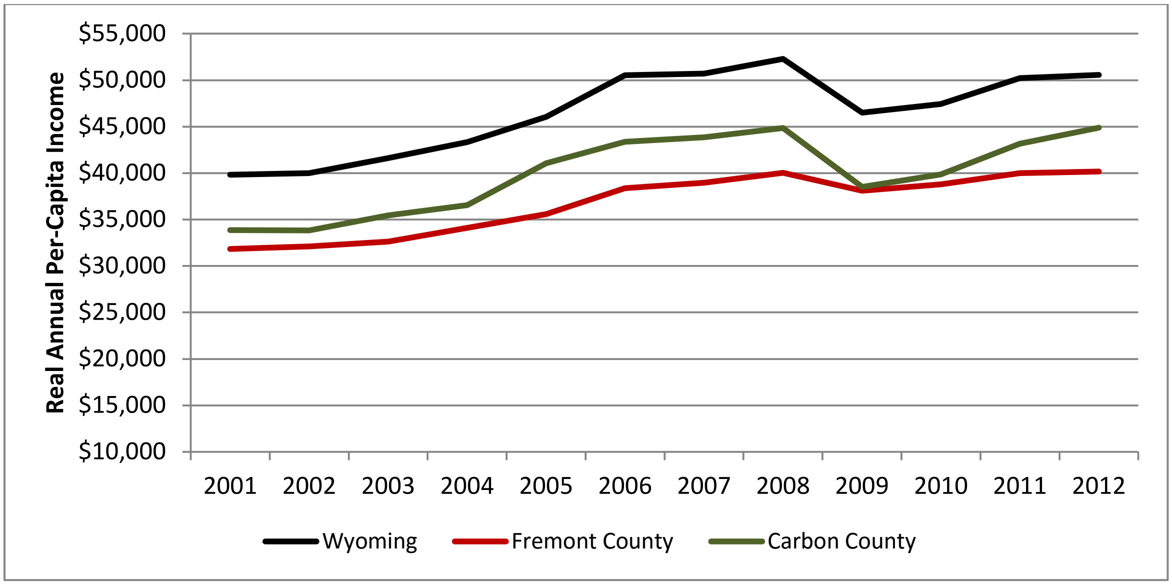
Unemployment Rates. Unemployment rates in Wyoming remained below the national average between 2000 and 2013. During this time, unemployment rates in Fremont County exceeded unemployment rates in Carbon County and statewide unemployment rates (see Figure 3.4-2). Unemployment rates were lowest in 2007, when the unemployment rate was 2.8 percent in Wyoming, 3.7 percent in Fremont County and 2.9 percent in Carbon County. Unemployment rates were highest in 2010, at 7.0 percent across Wyoming, 8.1 percent in Fremont County and 7.7 percent in Carbon County. In 2013, unemployment rates had fallen to 4.6 percent in Wyoming, 5.9 percent in Fremont County, and 4.5 percent in Carbon County (BLS, 2014b).



[1] Source: BLS, 2014b.

Figure 3.4-2
National, State and County Unemployment Rates, 2000 - 2013[1]

Income. A common measure of economic health is per-capita personal income. Due to inflation, the purchasing power of the dollar changes over time, so in order to compare dollar values from one year to another, they need to be converted from nominal (current) dollar values to constant or real, dollar values. Between 2001 and 2012, real per-capita income levels and growth rates were lower in Fremont County than in Carbon County and the state as a whole (see Figure 3.4-3). In 2012, real per-capita income (measured in constant 2012 dollars) averaged $50,567 in Wyoming, $40,177 in Fremont County, and $44,882 in Carbon County (BEA, 2014b). Between 2001 and 2012, real per capita income increased 27 percent in Wyoming, 26 percent in Fremont County, and 33 percent in Carbon County.



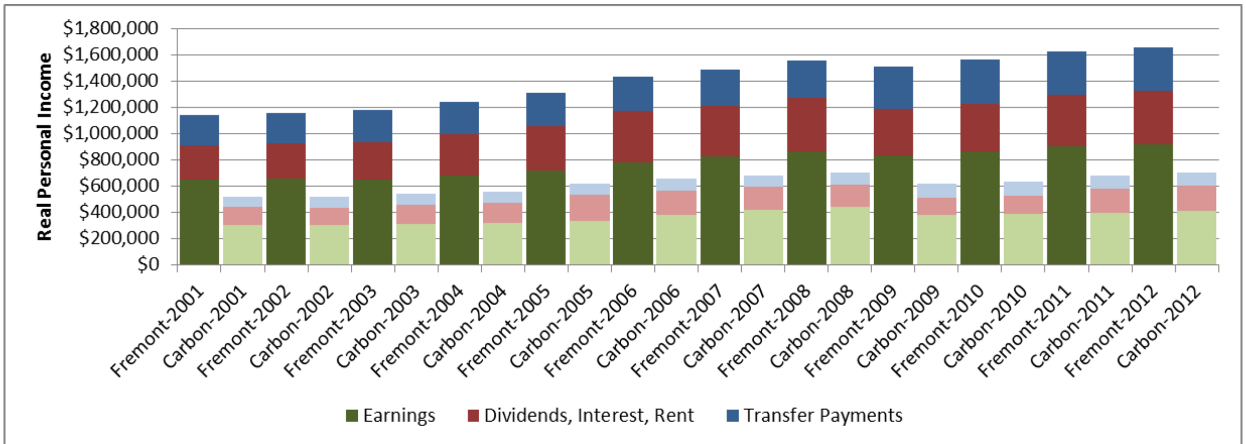
[1] Source: BEA, 2014b.
[2] All dollars expressed in constant 2012 dollars.

Figure 3.4-3
Real Per-Capita Income in Fremont County, Carbon County and Wyoming, 2001 2012[1,2]

Total personal income within a county includes residents' net earnings and non-earned income from dividends, interest and rent, and transfer payments. Net earnings consist of total earnings less contributions for government social insurance. Income from dividends, interest, and rent is also referred to as "investment income." Transfer payments include retirement, disability insurance benefits, medical payments, income maintenance benefits, unemployment insurance benefits, and veterans' benefits.

Total personal income in Fremont and Carbon counties is heavily dependent on earnings (see Figure 3.4-4). Between 2001 and 2012, net earnings comprised an average of 55 percent of personal income in Fremont County and an average of 59 percent in Carbon County. During this time, investment income contributed an average of 25 percent to personal income in Fremont County and an average of 26 percent in Carbon County. Transfer receipts accounted for an average of 20 percent of personal income in Fremont County and 15 percent in Carbon County.

Between 2001 and 2012, all components of personal income increased more rapidly in Fremont County than in Carbon County. After adjusting for inflation, in Fremont County net earnings increased 42 percent, investment income increased 54 percent, and transfer receipts increased 45 percent. In Carbon County, inflation-adjusted earnings increased 34 percent, investment income increased 46 percent, and transfer payments increased 31 percent (BEA, 2014b).



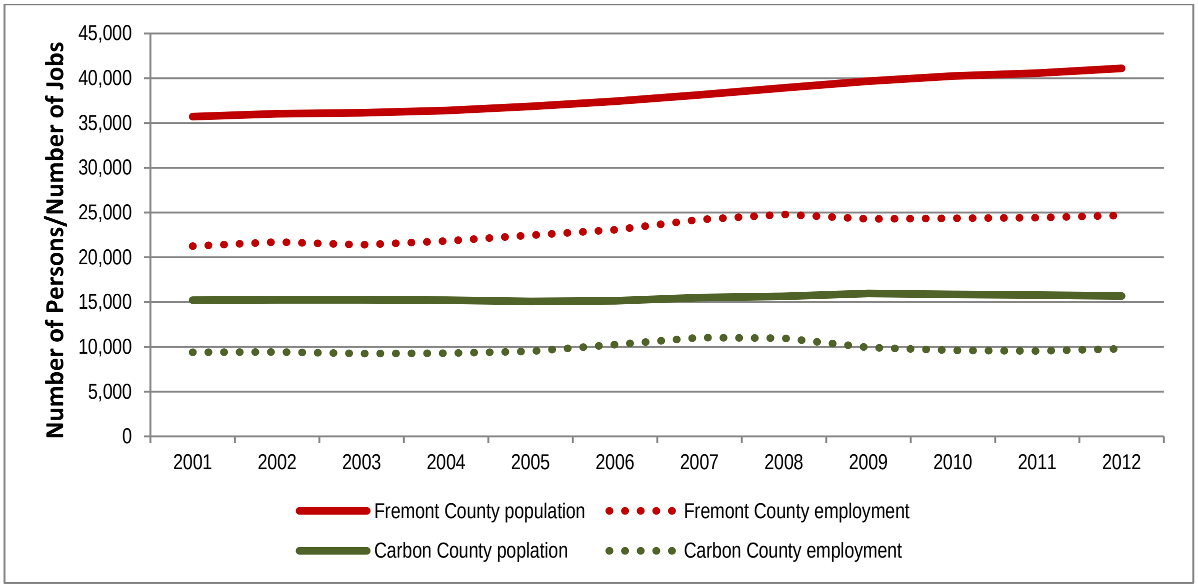
[1] Source: BEA, 2014b.
[2] All dollars expressed in constant 2012 dollars.

Figure 3.4-4
Components of Personal Income, Fremont and Carbon Counties, 2001 – 2012[1,2]

Commuting Patterns. The Census Bureau's American Community Survey (ACS) collects information on county commuting patterns. Between 2008 and 2012, 95 percent of Fremont County's workforce worked in Fremont County and 3.4 percent of the county's workforce worked outside the county. During this time, 86 percent of Carbon County's workforce worked in Carbon County, and 12 percent worked outside the county (Census Bureau, 2013a). The Wyoming Department of Workforce Services (WDWS) analyzes inter-county commuting patterns. At the time this report was written, inter-county commuting data were available between 2004 and 2011. Fremont County was a net exporter of labor between 2004 and 2006 (that is, more residents of Fremont County worked outside the county than residents of other counties worked in Fremont County), and became a net importer of labor in 2007. Worker commuting trends in Carbon County have tended to be opposite those in Fremont County; Carbon County was a net importer of labor between 2004 and mid-2007, and has generally been a net labor exporter since that time (WDWS, 2010 and 2012).

3.4.4.2 Population

Population trends typically follow employment trends. Figure 3.4-5 shows the relationship between employment and population in Fremont and Carbon counties between 2001 and 2012 and illustrates that population and employment have followed similar trends in each county. Between 2001 and 2012, employment in Fremont County increased 16 percent and the population increased 15 percent. In Carbon County, employment and population increased more modestly, at 4 percent, and 3 percent, respectively.



[1] **Sources: WDAI, 2013a, BEA, 2014a.**

Figure 3.4-5
Employment and Population, Fremont and Carbon Counties, 2001 – 2012[1,]

Population Trends. In 2010, Fremont County had 40,123 residents, and Carbon County had 15,885. Since 1990, population growth in Fremont and Carbon counties has lagged that of the state as a whole. Between 1990 and 2000, Wyoming's population increased by approximately 9 percent, while Fremont County's population increased by 6 percent and Carbon's County's population decreased 6 percent (see Table 3.4-5). Between 2000 and 2010, many of Wyoming's counties, especially those with active mineral development industries, experienced high population growth. Population gains during the decade averaged 14 percent across Wyoming, 12 percent in Fremont County, and 2 percent in Carbon County (Wyoming Department of Administration and Information – WDAI, 2013a). These statistics do not reflect increases in temporary populations associated with the region's surge in natural gas development since 2000.

Table 3.4-5
Population Estimates, Forecasts and Grow Rates[1]

Place	Population Estimates						Population Growth Rates (Percent)			
	1990	2000	2010	2013	2020	2030	1990-2000	2000-2010	2010-2020	2020-2030
Wyoming	453,589	493,782	563,626	580,670	622,360	668,830	8.9	14.1	10.4	7.5
Fremont County	33,662	35,804	40,123	41,460	44,360	47,120	6.4	12.1	10.6	6.2
Lander	7,023	6,867	7,487	7,736	8,278	8,793	-2.2	9.0	10.6[2]	6.2[2]
Riverton	9,202	9,310	10,615	10,969	11,736	12,466	1.2	14.0	10.6[2]	6.2[2]
Jeffrey City	253	106	58	NR[3]	NR[3]	NR[3]	-58.1	-45.3	--	--
Carbon County	16,659	15,639	15,885	15,940	16,380	16,270	-6.1	1.6	3.1	-0.7
Rawlins	9,380	9,006	9,259	9,291	9,548	9,483	-4.0	2.8	3.1[2]	-0.7[2]

[1] Source: WDAI, 2013a.
[2] Projected local growth rates are equal to WDAI's projected growth rate for the county in which the town is located.
[3] NR = Not Reported (not estimated by WDAI).

According to the Census Bureau's decennial censuses, Riverton's population increased approximately 1 percent (108 people) during the 1990s, while Lander's population fell 2 percent (156 people) (Census Bureau, 2001). Both cities had strong population growth during the 2000s: Riverton's population increased 14 percent (1,305 people) and Lander's population increased 9 percent (620 people) between 2000 and 2010 (Census Bureau, 2011). These statistics are likely to underestimate Riverton and Lander's growth because much of the new development has been outside city limits. County and city permits associated with new residential construction indicate that a sizeable portion of these communities' growth has occurred in unincorporated areas. Outside city limits, new residential development in Fremont County requires a septic permit. Between 2000 and 2010, Fremont County issued 434 septic permits for new residential construction within a 10-mile radius of Riverton, and 381 permits within 10 miles of Lander (Lopez, 2012). During this time, building permits were issued for 346 new residential units inside Riverton city limits, and 167 building permits were issued within Lander city limits (WDAI, 2013b).

In Carbon County, Rawlins' population fell 4 percent during the 1990s (374 people) and increased 3 percent (253 people) during the 2000s. The populations of communities near the Project Area have fallen dramatically over the past two decades. The unincorporated community of Jeffrey City lost 77 percent of its population (196 people) between 1990 and 2010. Although it is not included in Table 3.4-2, the Town of Bairoil, in Sweetwater County, lost 55 percent of its population (125 people) between 1990 and 2010. In 2010, Jeffrey City had 58 residents and Bairoil had 103 (WDAI, 2013a).

Projecting long-term population growth is difficult, especially in areas such as Wyoming, where population trends are influenced by trends in mineral development, which are, in turn, affected by fluctuating commodity prices. Some of the projects that may affect future population trends in Fremont and Carbon counties are discussed in Chapter 5, Section 5.4.15. The WDAI projects that, between 2010 and 2030, population growth rates in Fremont County will be comparable to statewide growth rates and that growth rates in Carbon County will continue to be lower. Between 2010 and 2020, Fremont County is projected to gain 4,237 residents and Carbon County is projected to gain 495 residents (WDAI, 2013a).

Population by Age. The age distribution of Carbon County's population is broadly comparable to that of the state as a whole. Fremont County has slightly higher portions of non-working age populations (under 20 and over 64 years of age) than the state and Carbon County (see Table 3.4-6). In 2012, persons under 20 years of age accounted for 26 percent of the state's population, 28 percent of Fremont County's population, and 25 percent of Carbon County's population. Persons between the ages of 20 and 64 years of age, who comprise the majority of the labor force, accounted for 61 percent of the state's population, 57 percent of Fremont County's population, and 62 percent of Carbon County's population. Persons aged 65 and older, who are at or nearing retirement, accounted for 13 percent of the state's population, 15 percent of Fremont County's population, and 14 percent of Carbon County's population (WDAI, 2013a).

Table 3.4-6
Wyoming, Fremont and Carbon County Populations by Age, 2012[1]

Age Range	Wyoming		Fremont County		Carbon County	
	Number	Percent	Number	Percent	Number	Percent
Under 10 Years	77,487	13.4%	6,093	14.8%	2,030	13.0%
10 to 19 Years	73,556	12.8%	5,249	12.8%	1,879	12.0%
20 to 34 Years	123,690	21.5%	7,763	18.9%	3,211	20.5%
35 to 49 Years	104,062	18.1%	6,828	16.6%	2,906	18.5%
50 to 64 Years	122,109	21.2%	8,908	21.7%	3,528	22.5%
65 Years and Older	75,508	13.1%	6,269	15.2%	2,112	13.5%
Total	576,412	100.0%	41,110	100.0%	15,666	100.0%

[1] Source: WDAI, 2013a.

3.4.4.3 Boom and Bust Characteristics

Jeffrey City is an oft-cited example of the "boom and bust" cycle that many extractive industries can experience. In 1957, Western Nuclear Corporation opened the Split Rock Uranium Mill near Jeffrey City. The town grew rapidly during the uranium boom of the late 1950s, driven by growth in the U.S. nuclear defense program and a restricted domestic source of uranium. The next boom period occurred in the early 1970s. It is difficult to establish an accurate population in a boom town. Although the Census Bureau reported Jeffrey City's population to be 1,276 in 1980, this is below the combined total of mine employees and local school enrollments at that time. Jeffrey City's population is widely considered to have approximated 4,500 in 1979 (Amundson, 1995). However, after the Three Mile Island incident in 1979 and the growing availability of alternative sources of nuclear power plant fuel material, uranium prices plummeted, and Jeffrey City lost 95 percent of its population within three years. Jeffrey City had 253 residents in 1990, 106 residents in 2000, and 58 residents in 2010 (WDAI, 2013a).

3.4.4.4 Housing

Long Term Housing. Most of the housing stock in Fremont and Carbon counties consists of owner-occupied single-family homes. Between 2008 and 2012, single-family homes accounted for 70 percent of the housing units in Fremont County and 72 percent of the housing units in Carbon County. Mobile homes accounted for 17 percent and 16 percent of the housing units in Fremont and Carbon counties, respectively. Owners occupied 71 percent of the occupied housing units in Fremont County and 73 percent of the occupied housing units in Carbon County. Most rental units are located in urban areas; between 2008 and 2012 renters occupied approximately 36 percent of the occupied housing units in Lander, 39 percent of the occupied housing units in Riverton, and 31 percent of the occupied housing units in Rawlins (Census Bureau, 2013a). Table 3.4-7 shows the characteristics of the housing supply in communities near the Project Area. These Census estimates are likely to underestimate the number of temporarily-sited mobile homes and recreational vehicles, especially in rural areas.

Table 3.4-7
Housing Characteristics in Potentially Affected Communities Near the Project Area, 2007-2011[1]

Housing Characteristic	Fremont County	Jeffrey City	Lander	Riverton	Carbon County	Rawlins
Housing Units	17,710	56	3,201	4,867	8,580	3,828
Percent of Single-Family Homes (Detached)	69.9%	0.0%	69.3%	62.3%	71.5%	63.5%
Percent of Multifamily Homes	13.1%	100.0%	20.1%	25.3%	12.4%	23.3%
Percent of Mobile Homes	17.0%	0.0%	10.7%	12.2%	15.9%	13.0%
Percent of Boat, Van, RV, etc.	0.1%	0.0%	0.0%	0.2%	0.2%	0.2%
Occupied Housing Units	15.538	0	2,971	4,439	6,044	3,150
Percent Owner Occupied	71.4%	0.0%	63.9%	60.8%	73.2%	69.3%
Percent Renter-Occupied	28.6%	0.0%	36.1%	39.2%	26.8%	30.7%

[1] Source: Census Bureau, 2013a.

Although limited data on housing quality are available, the ACS reports data related to incomplete plumbing and kitchen facilities, which are indicators of potential housing problems. According to the 2012 ACS, 3.3 percent of all housing units in Fremont County and 8.4 percent of all housing units in Carbon County lacked complete kitchen facilities; a classification that includes a kitchen that is missing either a sink with piped hot and cold water, a range or cook top and oven, or a refrigerator. This compared to 2.9 percent of households statewide without complete kitchen facilities. In addition, 2.7 percent of all housing units in Fremont County and 9.1 percent of all housing units in Carbon County lacked complete plumbing facilities, a classification that includes units that lack either piped hot and cold water, a flush toilet, or a bathtub or shower. This compared to 2.3 percent of statewide households lacking complete plumbing facilities (Census Bureau, 2013a).

The Wyoming Rental Vacancy Survey, which is conducted semi-annually by the Wyoming Housing Database Partnership (WHDP), provides additional information about housing quality. The December 2013 survey suggests that the majority of rental housing in Fremont and Carbon counties is in adequate condition. According to the December 2013 survey, of the surveyed renter households in Fremont County who provided a response on the condition of their rental unit, 15 percent said their unit was in fair condition, 9 percent said their unit was in average condition, 50 percent said their unit was in good condition, and 27 percent said their unit was in excellent condition. Among surveyed Carbon County renter households who ranked their condition of their homes, 17 percent said their unit was in average condition, 65 percent said their unit was in good condition, and 18 percent said their unit was in excellent condition (WHDP, 2014a).

Since 2001, Fremont County has had a tighter rental market than Carbon County. Approximately 25 percent of the rental units in Fremont County are in Lander, and 33 percent are in Riverton. Between 2004 and 2012, average vacancy rates in Fremont County tended to remain near or below the 5 percent vacancy rate that indicates a balanced rental market, and rent levels generally increased (see Table 3.4-8). Rental units tend to be in multifamily dwellings, and between 2000 and 2010, multifamily units accounted for approximately 26 percent of the building permits issued by Fremont County, 30 percent of the building permits issued by the City of Lander, and 35 percent of the building permits issued by the City of Riverton (WDAI, 2013b). This indicates that the county's housing market has responded to the demand for rental units.

Nearly 60 percent of Carbon County's rental units are in Rawlins. With the exception of the period between the fourth quarter 2005 and 2nd quarter 2008, and, more recently, between the second and fourth quarters of 2012, average vacancy rates remained above 5 percent. Average rent levels tended to increase between 2002 and 2008, and then declined through early 2012 (WHDP, 2014a). Stimulated by expanding natural gas development in the Continental Divide area near Wamsutter, the average rent level in Carbon County has increased since the fourth quarter of 2011. Between 2000 and 2011, less than 2 percent of the building permits issued by Carbon County and none of the building permits issued by the City of Rawlins were for multi-family units (WDAI, 2013b).

Table 3.4-8
Vacancy Rates and Rents in Fremont and Carbon Counties, Second Quarter 2001 – Fourth Quarter 2013[1]

	Fremont County		Carbon County	
Quarter/ Year	Average Vacancy Rate	Average Rent[2]	Average Vacancy Rate	Average Rent[2]
2Q-2001	6.6%	$422	5.7%	$400
4Q-2001	5.4%	$416	16.1%	$377
2Q-2002	16.1%	$442	15.0%	$391
4Q-2002	8.5%	$424	9.6%	$387
2Q-2003	3.5%	$434	11.9%	$392
4Q-2003	5.7%	$452	11.0%	$415
2Q-2004	4.6%	$455	8.9%	$433
4Q-2004	2.9%	$469	14.5%	$442
2Q-2005	1.2%	$475	7.6%	$483
4Q-2005	1.9%	$484	3.7%	$470
2Q-2006	2.5%	$500	2.4%	$603
4Q-2006	1.4%	$533	1.0%	$666
2Q-2007	0.8%	$554	0.8%	$705
4Q-2007	1.4%	$564	1.0%	$713
2Q-2008	1.6%	$592	1.6%	$766
4Q-2008	1.9%	$647	10.8%	$788
2Q-2009	5.5%	$649	22.1%	$758
4Q-2009	5.0%	$674	16.0%	$746
2Q-2010	3.6%	$674	9.8%	$711
4Q-2010	3.2%	$705	14.1%	$732
2Q-2011	2.4%	$705	7.2%	$720
4Q-2011	3.8%	$716	6.7%	$746
2Q-2012	2.1%	$719	5.0%	$722
4Q-2012	2.9%	$730	3.1%	$808[3]
2Q-2013	2.8%	$736	6.4%	$829
4Q-2013	7.5%	NR[3]	11.4%	NR[3]

[1] WHDP, 2014a.
[2] Average rent for apartments, houses, and mobile homes.
[3] NR = Not Reported.

The cost of home ownership tends to be higher in Fremont County than Carbon County. Within Fremont County, housing costs tend to be higher in Lander than in Riverton. Between 2000 and 2012, the average residential sales price increased 96 percent in Fremont County and 114 percent in Carbon County (see Table 3.4-9). The U.S. Department of Housing and Urban Development (HUD) defines housing to be affordable if no more than 30 percent of a household's gross monthly income is spent on total housing costs (HUD, 2006). Assuming a 5 percent interest rate on a standard 30 year fixed loan, a 5 percent down payment, and the inclusion of property taxes and private mortgage insurance in monthly housing costs, based on HUD's housing affordability guidelines, an annual income of $27,425 would have been required to purchase the average priced house in Fremont County ($111,638) in 2001. This income level is above the county's average 2001 wage level of $23,899 and below the median household income of $32,503 and average 2001 mining sector wages of $41,669. In 2012, an annual income of $49,574 would have been required to purchase the average priced house in Fremont County ($201,800). In that year, the county's average wage level was $39,086, median household income was $47,906, and average mining sector wages were $82,018 (BLS, 2014a; Census Bureau, 2001; Census Bureau, 2013b).

Housing costs in Carbon County have coincided more closely with HUD's housing affordability guidelines. In 2001, an annual income of $20,924 was needed to purchase the average priced house in Carbon County ($85,176). This income level is below the county's 2001 average wage level of $24,823, median household income of $35,600, and average mining sector wages of $42,840. In 2012, an annual income of $37,658 would have been required to purchase the average priced house in Carbon County ($153,293). This income level is below the county's average 2012 wage level of $41,550, the median household income of $53,780 and average mining sector wages of $79,339.

Table 3.4-9
Average Residential Sales Prices in Fremont and Carbon Counties, 2000 – 2012[1]

Year	Fremont County	Carbon County	Year	Fremont County	Carbon County
2000	$102,957	$71,526	2007	$185,918	$148,813
2001	$111,638	$85,176	2008	$197,173	$151,093
2002	$113,828	$78,436	2009	$194,633	$155,259
2003	$125,767	$88,123	2010	$196,283	$150,244
2004	$132,245	$94,377	2011	$182,541	$137,302
2005	$140,975	$96,200	2012	$201,800	$153.293
2006	$163,775	$118,335			
[1] Source: WHDP, 2014a.					

Short Term Housing. Several motels and recreational vehicle (RV) parks provide short-term housing accommodations in communities near the Project Area. An internet search of lodging accommodations found approximately 1,822 motel rooms and 615 RV sites in Lander, Riverton, Jeffrey City, and Rawlins (see Table 3.4-10). Because these estimates are based on lodging and RV facilities with an on-line presence, they are likely to underestimate the number of short-term housing accommodations near the Project Area because they do not include smaller establishments and privately-let facilities that do not advertise on the internet.

Table 3.4-10
Short-Term Housing Accommodations Near the Project Area

Area	Hotels/Motels[1]		RV Campgrounds[2]	
	Number of Establishments	Number of Rooms	Number of Campgrounds	Number of Sites
Fremont County				
Lander	6	281	8	257
Riverton	12	809	2	45
Jeffrey City	--	--	1	18
Carbon County				
Rawlins	10	732	4	295
Study Area Total	**28**	**1,822**	**15**	**615**
[1] TripAdvisor.com, 2014.				

Future Housing Demand. The WHDP prepares annual forecasts of the demand for future housing under three forecasting scenarios: a moderate growth scenario, a strong growth scenario, and a very strong growth scenario. The scenarios vary in their assumptions concerning population and income growth and increasing rates of resource extraction (which exert a strong influence on population growth and distribution in Wyoming). The WHDP's housing need predictions suggest how housing markets in Wyoming counties are likely to behave in the long-term if consumers' future housing choices are similar to past trends.

Assuming that the Proposed Action becomes operational in late 2015, this assessment focuses on the WHDP's projected housing demand in the 2015 – 2020 timeframe. Over this period, the WHDP projects that Fremont County will require housing to accommodate an additional 654 to 867 households and that Carbon County will require housing to accommodate an additional 192 households (see Table 3.4-11). Within the study area, Riverton is expected to have the highest household growth and resultant need for housing, and Rawlins is expected to have the lowest. The WHDP projects that, between 2015 and 2020, Riverton will require housing to accommodate an additional 182 to 205 households, that Lander will require housing to accommodate an additional 136 to 152 households, and that Rawlins will require housing to accommodate an additional 103 households. Owner-occupied households account for the majority of projected household growth in all jurisdictions (WHDP, 2014b).

Table 3.4-11
Projected Household Growth in Fremont and Carbon Counties, Lander, Riverton and Rawlins, 2015 – 2020[1]

WHDP Growth Scenario	Fremont County	Lander	Riverton	Carbon County	Rawlins
Moderate Growth Scenario					
Total Households	654	136	182	192	103
Homeowner Households	476	91	123	142	73
Renter Households	177	45	59	49	30
Strong Growth Scenario					
Total Households	762	144	194	192	103
Homeowner Households	547	95	129	141	73
Renter Households	215	49	65	51	32
Very Strong Growth Scenario					
Total Households	867	152	205	192	103
Homeowner Households	612	98	134	141	73
Renter Households	255	54	71	51	32

[1] Source: WHDP, 2014b.

3.4.4.5 Community Services and Public Infrastructure

This section describes the community services, including schools, health care providers, law enforcement agencies, and emergency responders, that cover the Project Area and would potentially be affected by the Proposed Action, including relocating workers.

Schools. The Project Area is located in Fremont School District #1. The district has four elementary schools, one junior high school and one high school. With the exception of the Jeffrey City Elementary School (grades K-6), all schools in the district are located in Lander. Jeffrey City Elementary is a one-room school in which enrollments ranged from 2 to 13 students between 2001 and 2013 (Wyoming Department of Education, 2014). During this time, district-wide enrollment fell 12.6 percent. In 2012, the district had an overall student/teacher ratio of 10.4, which was below the statewide average of 10.8. Lander Christian Academy, a private school for grades K-8; Sunrise School, a public school (grades 1-12) serving special needs students, and Pathfinder Alternative High School are also located in Lander.

Fremont School District #25 is the largest district in the county, with four elementary schools, one middle school and one high school, all located in Riverton. District-wide enrollments increased 6 percent between 2001 and 2013 (see Table 3.4-12). In 2012, the district had an overall student/teacher ratio of 11.7.

Table 3.4-12
School District-Wide Enrollment, 2001 – 2012[1]

Year	Fremont SD 1		Fremont SD 25		Carbon SD 1	
	Student Enrollments	Student/ Teacher Ratio[2]	Student Enrollments	Student/ Teacher Ratio[2]	Student Enrollments	Student/ Teacher Ratio[2]
2001	1,933	11.9	2,484	11.2	1,923	12.0
2002	1,877	12.5	2,471	11.5	1,778	12.2
2003	1,855	12.0	2,425	12.6	1,728	11.2
2004	1,789	11.9	2,423	12.2	1,664	11.0
2005	1,745	11.7	2,422	11.9	1,727	11.1
2006	1,762	11.0	2,473	11.8	1,753	10.0
2007	1,734	10.9	2,355	11.0	1,815	10.4
2008	1,671	10.4	2,454	11.6	1,787	9.7
2009	1,670	10.3	2,465	11.5	1,803	9.7
2010	1,707	10.6	2,474	11.3	1,822	9.6
2011	1,710	10.0	2,588	11.5	1,814	9.6
2012	1,672	10.4	2,582	11.7	1,866	10.5
2013	1.689	NR[3]	2,642	NR[3]	1,876	NR[3]

[1] Source: Wyoming Department of Education, 2014.
[2] Based on the number of certified teachers and instructional aides within each school district.
[3] NR = Not Reported.

Rawlins and Bairoil are in Carbon School District #1. There are three elementary schools, one middle school, one high school, and one cooperative high school in Rawlins. The Town of Bairoil has a one-room elementary school (grades K-5) in which enrollments ranged between four and ten students between 2001 and 2013. The Bairoil Elementary School closed in November 2013 and its students are currently bussed to Sinclair Elementary School, approximately 48 miles from Bairoil, in Carbon County (Casper Star Tribune, 2014). Between 2001 and 2013, district-wide enrollments fell 2 percent. In 2012, the district had an overall student/teacher ratio of 10.5 (Wyoming Department of Education, 2014).

Central Wyoming College is a two-year community college located in Riverton, with a satellite site in Lander. In Rawlins, the Carbon County Higher Education Center provides adult education, vocational and industry training, and college credit courses through Western Wyoming Community College and the University of Wyoming.

Medical Services. Physicians and other medical practitioners in Lander, Riverton, and Rawlins provide medical services in the communities potentially affected by the Proposed Action. In addition to family and specialized medical services, the Lander Medical Clinic and Cedars Health Urgent Care clinics in Riverton and Rawlins provide emergency and urgent care services.

There are two hospitals in Fremont County. The largest, Lander Regional Hospital, is an 89-bed acute care facility whose services include surgery, laboratory, radiology, diagnostic imaging, physical and occupational therapy, respiratory therapy, and cardiac rehabilitation. The hospital's 24-hour emergency department is a state designated trauma facility. Riverton Memorial Hospital is a 70-bed acute care facility with services including 24-hour emergency and physician services, surgery, intensive care, diagnostic imaging, cardiopulmonary services, obstetrics, and laboratory services. Both hospitals arrange life flight services to hospitals in Casper, Billings, Salt Lake, and Denver.

In Rawlins, Memorial Hospital of Carbon County is a 35-bed acute care and critical access facility that offers medical, surgical, intensive care, and obstetrics inpatient services, and several outpatient services. Its emergency services include 24-hour emergency and physician services, full-time ambulance service, and life flight services.

Fremont County provides ambulance and emergency medical services across the county, including the Wind River Indian Reservation. Response calls by Fremont County Ambulance are dispatched out of Riverton and Lander. In July 2013, Fremont County Ambulance stationed an ambulance in Jeffrey City (County10, 2013). The ambulance is staffed by a part-time emergency medical technician (EMT) who lives in Jeffrey City and local volunteers, many of whom will have first responder certification. Local staffing levels and qualifications were not available at the time this report was written.

Public Safety and Emergency Services. The Fremont County Sheriff's Office provides first-call police services in the Project Area. The Sheriff's Office is a public safety answering point that dispatches 911 calls across the county, including the Wind River Indian Reservation. The Sheriff's Office has approximately 125 employees located across the county and a 200-bed detention center in Lander that typically operates near 75 percent capacity. There is one Sheriff's Deputy located in Jeffrey City.

Local police departments provide law enforcement services within their jurisdictions. In 2011, the Lander Police Department had 20 employees, including 19 officers. The Riverton Police Department had 39 employees, including 28 officers and 11 support personnel. The Rawlins Police Department had 29 employees, including 19 officers and 10 support personnel. The Carbon County Sheriff's Office, which has jurisdiction between Rawlins and the Carbon County border leading into Fremont County, had 28 employees, including 18 officers and 10 support personnel (Wyoming Attorney General, 2005-2011).

Table 3.4-13 shows the number of arrests reported by law enforcement agencies between 2006 and 2012. During this time, index offense arrests increased for all agencies except the Rawlins Police Department. Drug abuse violations increased for all police departments and decreased for the Fremont and Carbon county sheriff's offices. Arrests for other offenses increased in the Riverton and Lander police departments and decreased for the Rawlins Police Department and both sheriff's offices. Overall, the number of arrests decreased 38 percent for the Fremont County Sheriff's Office, increased 33 percent for the Lander Police Department, and increased 24 percent for the Riverton Police Department. In Carbon County, the number of total arrests decreased 20 percent for the Sheriff's Office and decreased 57 percent for the Rawlins Police Department (Wyoming Attorney General, 2005 – 2011). Larceny-theft accounts for the majority of index crimes in all jurisdictions, and driving under the influence, drunkenness, liquor law violations, and other assaults account for the majority of other offenses (Stanford, 2014).

The Jeffrey City Volunteer Fire Department (JCVFD) provides first-call emergency services in the Project Area with 11 volunteer firefighters. The JCVFD has a fire station in Jeffrey City, a garage and meeting space in the Sweetwater Station, three pumpers, two brush trucks, a 2,500 gallon tanker, a rescue unit, a ladder truck, and a mobile response unit (Darnell, 2012).

The Lander Volunteer Fire Department (LVFD) serves the City of Lander and upon request, provides assistance to other fire departments in the county. The LVFD has one station with 34 volunteer firefighters, including first-response medical service providers, three structure engines, a ladder truck, a light rescue truck, and a wild-land brush unit. The LVFD responds to approximately 300 calls a year, including first-response and fire calls (Hudson, 2012).

The Riverton Volunteer Fire Department (RVFD) serves the City of Riverton and a 10 mile radius around the city. The RVFD has three fire stations and 39 firemen, three of whom are emergency medical technicians, four fire trucks, and four water tenders. The RVFD responds to approximately 300 calls a year, including hazardous materials emergencies (Walters, 2012).

The Rawlins Fire Department has a full-time fire chief, six engineers, three captains, and 15 volunteers. The fire department has a command trailer, five fire engines, two rescue trucks, two mobile response units, a hazardous materials trailer, a mobile training unit, an aerial tower truck, and a training center (Hannum, 2012).

Table 3.4-13
Number of Arrests in Potentially Affected Jurisdictions, 2006 - 2012[1]

Year and Type Of Arrest	Fremont Co. Sheriff	Lander Police	Riverton Police	Carbon Co. Sheriff	Rawlins Police
2006					
Total Index Offense Arrests	33	54	100	16	102
Drug Abuse Violations	35	35	35	23	35
Other Offenses	602	473	1,152	409	1,268
Total Arrests	670	562	1,287	448	1,405
2007					
Total Index Offense Arrests	42	54	131	15	106
Drug Abuse Violations	16	30	56	17	41
Other Offenses	669	532	971	499	1,187
Total Arrests	727	616	1,158	531	1,334
2008					
Total Index Offense Arrests	48	75	233	11	95
Drug Abuse Violations	43	37	70	38	104
Other Offenses	600	529	1,044	482	1,038
Total Arrests	691	641	1,347	531	1,237
2009					
Total Index Offense Arrests	60	73	189	8	103
Drug Abuse Violations	43	37	90	38	73
Other Offenses	599	464	1,058	380	808
Total Arrests	702	574	1,337	426	984
2010					
Total Index Offense Arrests	28	84	203	8	73
Drug Abuse Violations	36	43	111	45	77
Other Offenses	414	703	1,092	341	687
Total Arrests	478	830	1,406	394	837
2011					
Total Index Offense Arrests	38	79	200	21	90
Drug Abuse Violations	39	38	108	44	61
Other Offenses	389	634	1,235	347	627
Total Arrests	466	751	1,543	412	778
2012[2]					
Total Index Offense Arrests	41	81	246	20	86
Drug Abuse Violations	33	57	115	19	75
Other Offenses	345	608	1,233	318	447
Total Arrests	419	746	1,594	357	608

[1] Wyoming Attorney General, 2005 – 2011.
[2] Stanford, 2014.

3.4.4.6 Fiscal Conditions

The minerals industry accounts for a substantial share of revenues to the state and local governments in Wyoming. Mineral producers pay state severance tax, county property (ad valorem-gross products) tax on production, and county property (ad valorem) tax on plants, mining, and wellhead equipment, pipelines, and other facilities used in mineral production and transportation operations. Because the Project Area is located in Fremont County, the Proposed Action would have the greatest effects on local government revenues in that county. Therefore, the description of local government revenues in this section focuses on Fremont County.

County Revenues. Over the past several years, the largest sources of revenue to Fremont County government have been property taxes, grants and contributions, and sales and use taxes. From 2006 to 2012, property taxes contributed between 24 percent and 35 percent of Fremont County's revenues (see Table 3.4-14). Grants and contributions, which include operating and capital grants, comprised between 22 percent and 35 percent of the county's budget (with capital grants accounting for most of the variation); and sales and use taxes comprised between 14 percent and 19 percent. In 2011, charges for services overtook sales and use tax as the county's third largest revenue source.

Fremont County receives payments from the federal government to help offset losses in property taxes due to non-taxable federal lands within its boundaries. These payments, known as Payments in Lieu of Taxes, or PILT, are made annually for tax exempt federal lands administered by the BLM, the NPS, the FWS, and for Federal water projects. Between 2006 and 2012, PILT accounted for between 4 percent and 11 percent of Fremont County revenues.

Table 3.4-14
Fremont County Budget Revenue Sources, 2006 – 2012[1] (million dollars)

Revenue Source	2006	2007	2008	2009	2010	2011	2012
Property Tax	$8.58	$11.27	$10.61	$7.61	$9.24	$7.72	$9.68
Grants & Contributions[2]	$11.00	$7.73	$14.19	$7.70	$6.89	$6.76	$8.25
Sales & Use Tax	$4.83	$4.83	$6.01	$4.54	$5.97	$4.60	$5.07
Charges for Services	$3.04	$3.52	$4.23	$4.49	$4.53	$4.68	$5.28
Federal PILT[3]	$1.58	$1.61	$1.56	$3.53	$1.85	$2.13	$2.33
State Assistance	$1.38	$0.97	$1.36	$1.15	$1.10	$0.88	$1.07
Investment Earnings	$0.03	$1.61	$1.54	$0.20	$0.86	$0.19	$0.67
Severance Tax	$0.45	$0.32	$0.39	$0.40	$0.41	$0.40	$0.39
Other	$0.36	$0.32	$0.54	$1.55	$0.62	$0.47	$0.32
Total County Revenue	$31.20	$32.20	$40.28	$31.17	$31.46	$27.84	$33.01

[1] Source: Fremont County, 2007 – 2013.
[2] Includes grants and contributions to the Fremont County fair, library, and museum.
[3] Payments in lieu of taxes (PILT).

Property Taxes. Mineral development, including uranium, affects a county's fiscal status largely through its impact on the property, or ad valorem, tax base. Ad valorem taxes are based on assessed valuations, which are determined, in part, by assessment rates. In Wyoming, mineral production is assessed at 100 percent of its fair market value, industrial property is assessed at 11.5 percent of its fair market value, and all other properties are assessed at 9.5 percent of fair market value.

Table 3.4-15 shows the increase in assessed valuations in Fremont County between 2005 and 2012. During this time, locally assessed valuations, which include agricultural, commercial, industrial, residential, and vacant land; and real and personal property, accounted for 19 percent to 50 percent of the county's total assessed valuation. Mineral production, nearly all of which consisted of natural gas and oil production, accounted for 47 percent to 79 percent of the county's assessed valuation (Campbell, 2012, Fremont County, 2013).

Table 3.4-15
Fremont County Assessed Valuation, 2005 - 2012 (million dollars)

Year	Locally Assessed Valuation	State Assessed Valuations				Total Assessed Valuation
		Utilities	Natural Gas	Oil	Other Minerals[1]	
2005[2]	$243.00	$18.77	$638.40	$84.71	$0.53	$985.40
2006[2]	$265.09	$19.52	$978.03	$112.41	$0.58	$1,375.64
2007[2]	$303.3	$20.19	$734.96	$131.27	$0.69	$1190.54
2008[2]	$344.77	$20.66	$337.91	$144.21	$0.94	$848.48
2009[2]	$367.18	$21.40	$463.71	$226.08	$1.08	$1,079.45
2010[2]	$381.99	$20.57	$211.38	$149.74	$0.88	$764.57
2011[2]	$385.16	$20.79	$315.85	$229.64	$0.71	$962.15
2012[3]	$385.64	$23.76	$314.13	$292.30	$0.72	$1,016.56

[1] Consists primarily of sand and gravel production.
[2] Source: Campbell, 2012.
[3] Source: Fremont County, 2013.

Severance Taxes. The State of Wyoming assesses a severance tax on uranium of 4.0 percent of the taxable value of the current year's production at the point where the production process is complete, before processing and transportation. The effective tax rate on uranium production is 1.8 percent (Temte, 2010). Uranium produced on federal lands is not subject to royalty payments.

Between 2001 and 2012, the taxable value of uranium produced in Wyoming ranged from $8.1 million to $42.9 million (see Table 3.4-16). This accounts for less than 1 percent of the total taxable value of mineral production in the state during the decade.

Table 3.4-16
Taxable Value of Uranium Production in Wyoming, 2001 - 2012[1] (million dollars)

Year[1]	Mineral Production		Year	Mineral Production	
	Uranium	All Minerals[2]		Uranium	All Minerals[2]
2001[3]	$13.0	$6,407.1	2007[3]	$17.0	$14,586.4
2002[3]	$10.2	$6,738.7	2007[3]	$19.9	$13,845.5
2003[3]	$9.1	$5,624.3	2009[3]	$11.4	$20,396.9
2004[3]	$8.1	$8,616.0	2010[4]	$22.7	$12,583.8
2005[3]	$9.3	$10,987.2	2011[5]	$32.7	$15,493.4
2006[3]	$12.3	$14,906.4	2012[6]	$42.9	$16,186.7

[1] Year tax revenue received, based on production during the previous calendar year.
[2] Includes natural gas, oil, coal, trona, bentonite, sand and gravel, uranium, decorative stone, clay, feldspar, granite, gypsum, silver, limestone, shale, gold, zeolite, leonardite, and moss rock.
[3] Wyoming Department of Revenue, 2009.
[4] Wyoming Department of Revenue, 2010.
[5] Wyoming Department of Revenue, 2011.
[6] Wyoming Department of Revenue, 2012.

Due to wide fluctuations in mineral prices and production levels, the Wyoming State Legislature changed the method through which severance taxes are distributed to state funds and entities in 2002. Prior to that time, state accounts received a fixed percentage of severance tax collections. Severance tax distributions were "de-earmarked" in 2002, and since then, the portion of total severance taxes going to individual funds has been based on a legislative formula and varies from year to year based on individual mineral valuations and overall severance tax totals. Between 2002 and 2011, severance tax distributions averaged 36 percent to the Permanent Wyoming Mineral Trust Fund Reserve; 28 percent to the state's budget reserve; 27 percent to the General Fund; 3 percent to cities or towns and counties; 3 percent to water development projects; 1 percent to the Leaking Underground Storage Tanks account; 1 percent to the Wyoming Highway Fund; 0.6 percent to road construction projects; and 0.5 percent to the state's capital construction account (Wyoming Department of Revenue, 2013).

3.4.4.7 Off-Site Processing at the Sweetwater Mill

The Sweetwater Mill is located in northeast Sweetwater County, approximately 33 miles south of the Project Area, 30 miles north of Wamsutter, 36 miles southwest of Bairoil, and 43 miles northwest of Rawlins. The Sweetwater Mill has been idle since the mid-1980s, and although extensive mineral development occurred in the surrounding area between the 1970s and mid-1990s, the area is currently characterized by open range and livestock grazing. Most of Sweetwater County's population lives near the Interstate-80 corridor in the southwestern part of the county. In 2013, over 80 percent of the county's population of 45,260 lived in Rock Springs and Green River, 98 and 123 miles, respectively, from the Sweetwater Mill. The communities closest to the Sweetwater Mill, Bairoil and Wamsutter, have experienced significant population shifts over the past 20 years. Between 1990 and 2013, Bairoil's population decreased from 228 to 110, and Wamsutter's population increased from 240 to 466 (WDAI, 2013a).

In 2012, annual wages averaged $41,550 in Sweetwater County. By industry, annual wages ranged from a high of $79,339 in the Mining sector to a low of $17,546 in the Accommodations and Food Services sector (BLS, 2014a). Personal income in Sweetwater County is heavily depending on earnings, which make up a larger portion of personal income in Sweetwater County than they do in Fremont and Carbon counties. Between 2001 and 2012, net earnings comprised approximately 75 percent of personal income in Sweetwater County, transfer payments comprised 9 percent, and dividends, interest and rent comprised 16 percent (BEA, 2014b).

Buoyed by oil and gas development, unemployment rates in Sweetwater County have generally been comparable to or lower than statewide unemployment rates and lower than unemployment rates in Fremont and Carbon counties since 2000. Between 2000 and 2013, the unemployment rate in Sweetwater County ranged from a low of 2.2 percent in 2007 to a high of 6.8 percent in 2010. In 2013, Sweetwater County's unemployment rate was 4.0 percent, compared to 4.6 percent for the State of Wyoming, 5.9 percent in Fremont County, and 4.5 percent in Carbon County (BLS, 2014b).

Most of the housing stock in Bairoil, Wamsutter and surrounding rural areas consists of owner-occupied single-family or mobile homes. Between 2008 and 2012, single-family homes and mobile homes accounted for all of the housing units in Bairoil, 94 percent of the housing units in Wamsutter, and 97 percent of the housing units in the Wamsutter Census County Division, which extends from the Fremont County line to the north, to just south of Interstate 80 to the south, and from near the Carbon County line to the east to Table Rock to the west. Owners occupied 98 percent of the occupied housing units in Bairoil, 59 percent of the occupied housing units in Wamsutter, and 74 percent of the occupied housing units in the Wamsutter Census County Division (Census Bureau, 2013b).

Bairoil and Wamsutter have limited community services. Historic enrollments at the now-closed Bairoil Elementary School (K–5) were discussed in Section 3.4.4.5 above. Between 2001 and 2013, enrollments at the Desert Elementary School (K–6) in Wamsutter ranged from 27 to 71 students (Wyoming Department of Education, 2014). Students from both towns are bussed to Rawlins for junior high and high school. The Wamsutter Community Health Clinic provides routine and urgent care medical services. The Wamsutter Volunteer Fire Department provides first-response fire and emergency services in eastern Sweetwater County. Fire District #1, dispatched out of Rock Springs, provides back-up fire response and Sweetwater Medic, also dispatched out of Rock Springs, provides back-up emergency medical response (Urbatsch, 2014).

Revenues to Sweetwater County government are highly dependent on mineral revenues. Between 2010 and 2012, mineral production, which included trona, crude oil, natural gas, and coal, accounted for between 62 and 70 percent of Sweetwater County's total assessed valuation (Sweetwater County, 2014). The Lost Creek Uranium In-Situ Recovery Project began operating in August of 2013. The Lost Creek Project is located in northeast Sweetwater County, approximately 15 miles southwest of Bairoil and 17 miles south of the Project Area.

3.4.5 Environmental Justice

Executive Order 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of programs, policies, and activities on minority and low-income populations. Minority populations are members of one of the following racial groups: Black/African-American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islanders, "other" races, or multi-racial (CEQ, 1997). According to the 2012 ACS, racial minorities comprised 8.8 percent of Wyoming's statewide population, 25.8 percent of Fremont County's population, 0.0 percent of the Jeffrey City Census County Division's population, and 9.1 percent of Carbon County's population between 2008 and 2012

(Census Bureau, 2013a). During this time, persons of Hispanic origin, who may be of any race, comprised 8.9 percent of Wyoming's population, 5.8 percent of Fremont County's population, 0.0 percent of the Jeffrey City Census County Division's population, and 16.7 percent of Carbon County's population.

The Census Bureau defines low-income populations as individuals whose income during the previous 12 months fell below the poverty level. According to the Census Bureau's Small Area Income and Poverty Estimates database, in 2012, low income populations comprised approximately 12 percent of the state's population, 16 percent of Fremont County's population, and 13 percent of Carbon County's population (Census Bureau, 2013b). Data on low income populations are not available for the Jeffrey City Census County Division. Table 3.4-17 summarizes racial, ethnicity, and poverty data in Wyoming and Fremont and Carbon counties, and the Jeffrey City Census County Division.

Table 3.4-17
Minority and Low Income Populations in
Fremont County, Carbon County, Jeffrey City Census County Division (CCD), and Wyoming, 2008 - 2012

Racial and Poverty Characteristics	Wyoming	Fremont County	Jeffrey City Census County Division[2]	Carbon County
Minority Populations[1]				
African American	0.8%	0.4%	0.0%	0.8%
American Indian & Alaska Native	2.3%	21.1%	0.0%	0.7%
Asian & Pacific Islander	0.8%	0.6%	0.0%	1.2%
Some Other Race	2.1%	1.1%	0.0%	3.6%
Two or More Races	2.7%	2.5%	0.0%	2.9%
Total Racial Minorities	8.8%	25.8%	0.0%	9.1%
Hispanic (ethnicity)[2]	8.9%	5.8%	0.0%	16.7%
Low Income Populations[3]				
Median Household Income	$55,104	$47,906	NA[5]	$53,780
Percent of Individuals in Poverty[4]	11.9%	16.2%	NA[5]	13.4%

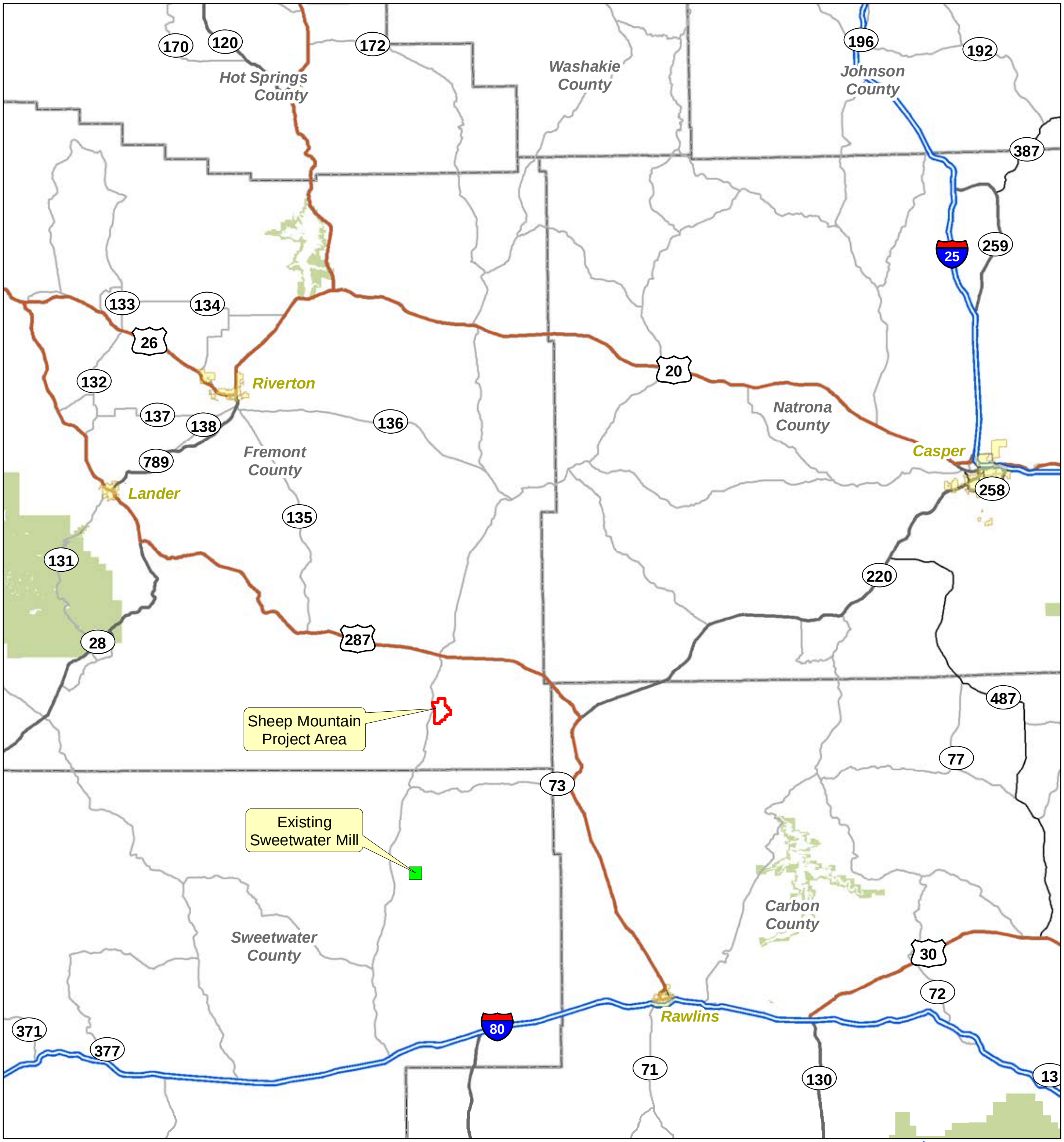
[1] Source: Census Bureau, 2013a.
[2] Hispanic origin is considered an ethnicity, not a race. Hispanics may be of any race.
[3] Source: Census Bureau, 2013b.
[4] Percent of individuals whose income in the previous 12 months was below the poverty level.
[5] NA=Not Available. The Census Bureau's Small Area Income and Poverty Estimates (Census Bureau, 2013b) do not report income and poverty data for CCDs.

Off Site Processing at the Sweetwater Mill. Between 2008 and 2012, racial minorities comprised 8.3 percent of Sweetwater County's population and persons of Hispanic origin comprised 15.2 percent (Census Bureau, 2013a). In 2012, low-income populations comprised 8.4 percent of Sweetwater County's population (Census Bureau, 2013b).

3.4.6 Transportation/Access

3.4.6.1 Access Roads

The Project Area is located in the southeast corner of Fremont County, approximately 60 miles from Lander, 62 miles from Riverton, 65 miles from Rawlins, and 105 miles from Casper. Map 3.4-1 shows the regional roadway system. US Highway 287 and Wyoming state highways 789 and 135 link the Project Area to Lander and Riverton. US Highway 287 and Wyoming State Highway (WY 789) are the same road between Rawlins and Sweetwater Station. US Highway 287/WY 789 links the Project Area to Rawlins and Interstate-80. US Highway 287/WY 789 and WY 220 link the Project Area to Casper and Interstate 25. Because it is likely that some Project-related traffic would originate in Casper, WY 220 in Natrona County is included in reporting of current traffic levels in this section.



Map 3.4-1
Regional Roadway System

Sheep Mountain Project Area

0 15 30 Miles

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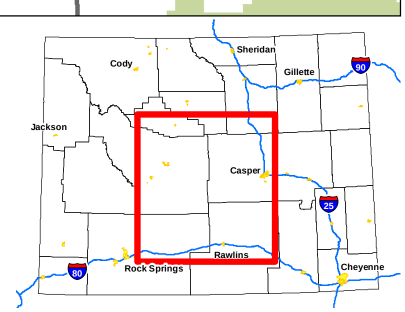


The Project Area is accessed directly by Crooks Gap/Wamsutter Road (Fremont County Road 318), which connects to US Highway 287/WY 789 at Jeffrey City, 8 miles north of the Project Area. To the south, Crooks Gap/Wamsutter Road enters Sweetwater County, where it becomes Sweetwater County Road 4-23 (also known as Crooks Gap/Wamsutter Road) and intersects Interstate-80 at Wamsutter, 53 miles south of the Project Area. The entire length of Crooks Gap/Wamsutter Road is unpaved with an improved gravel surface. Although there are several unimproved roads in the vicinity of the Project Area, many of these roads are not maintained or open during the winter.

Table 3.4-18 shows 2010 and 2011 annual average daily traffic (AADT) volumes on highways in the vicinity of the Project Area. Between 2010 and 2011, traffic levels remained relatively constant on US Highway 287/WY 789 between Rawlins and Muddy Gap, and on WY 220 between Muddy Gap and Casper. During this time, AADT on segments of US Highway 287 between Muddy Gap and Lander decreased by an average of 7 percent, and AADT on segments of WY 135 between Sweetwater Station and Riverton decreased by an average of 23 percent (WYDOT, 2012a). The decrease in traffic on WY 135 corresponds to completion of the Wind River Hotel and Casino near Riverton.

3.4.6.2 Road Maintenance

WYDOT maintains US Highway 287/WY 789, WY 135, and WY 220. Fremont County and Sweetwater County are responsible for maintaining their respective portions of Crooks Gap/Wamsutter Road. In both counties, the Crooks Gap/Wamsutter Road is treated with magnesium chloride and has no vehicle or weight restrictions. Southern portions of the road are frequently impassible in the winter due to blowing snow (Buffington, 2011). Winter road conditions tend to be better on northern portions of Crooks Gap/Wamsutter Road between US Highway 287/WY 789 and the Project Area because there are snow fences and the road has been elevated to be above blowing snow (Brody, 2012). This portion of Crooks Gap/Wamsutter Road also provides access to the Crooks Gap oil field which is located northwest of the Project Area (see Map 3.2-6).

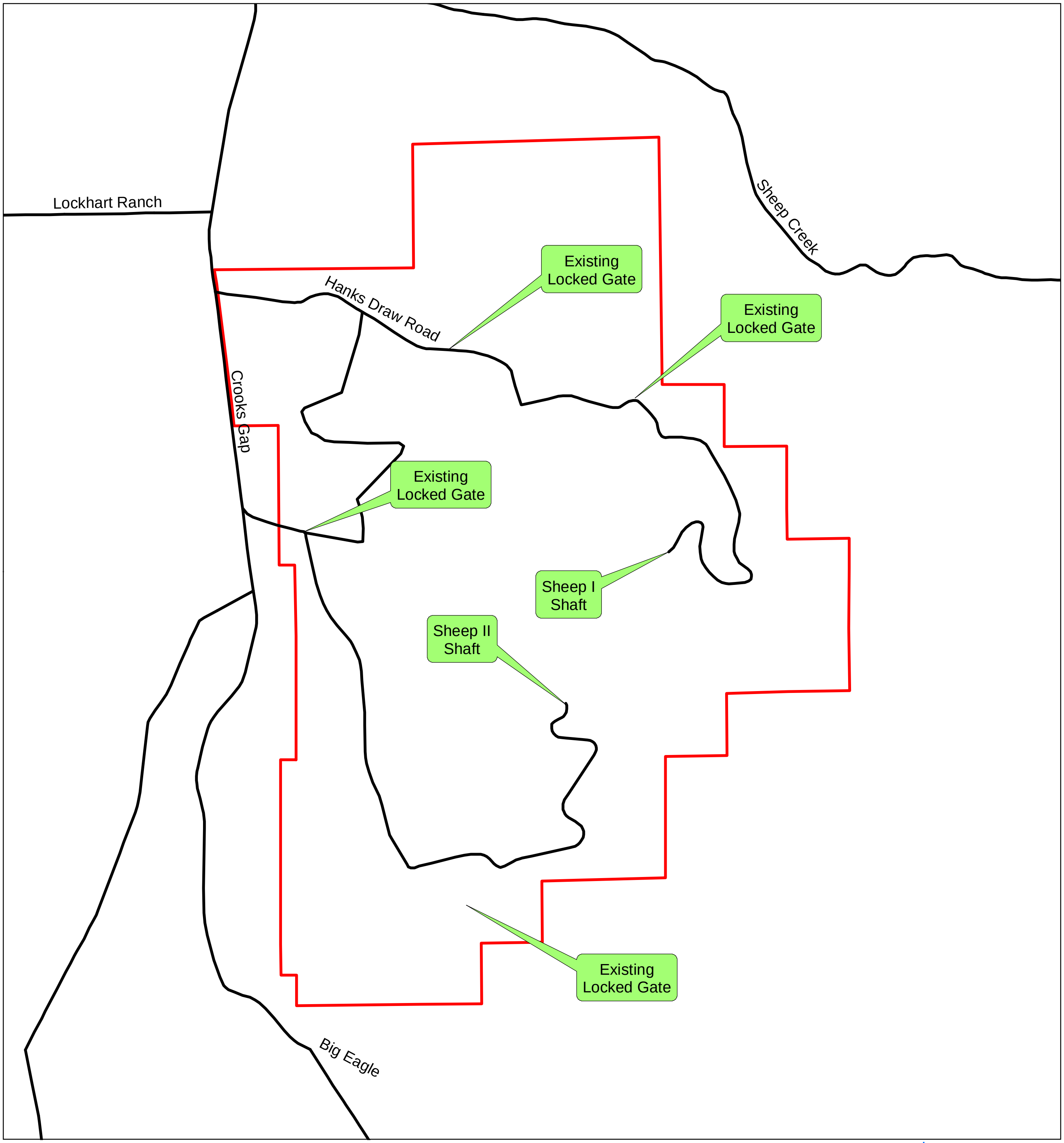
3.4.6.3 On-Site Roads

Two gravel-surfaced roads provide access from Crooks Gap/Wamsutter Road into the Project Area, but access is restricted to the public by locked gates (see Map 3.4-2). The northern access route (Hanks Draw Road) begins near the site's northwest corner and travels 3.46 miles along Hanks Draw to the Congo Pit and Sheep I Shaft. The southern access road exits Crooks Gap/Wamsutter Road approximately 1 mile south of Hanks Draw Road, and travels 3.26 miles to the Sheep II Shaft. The road originally continued on to meet Hanks Draw Road at the Sheep I mine shaft, but due to surface drainage and erosion problems, Energy Fuels reclaimed the road between the Sheep I and Sheep II shafts in 2010 (BRS Engineering, 2011). Several driveable two track roads and many more unpassable drilling roads dissect the Project Area, but are not described here in detail because they have not been inventoried and do not attribute to traffic within the Project Area.

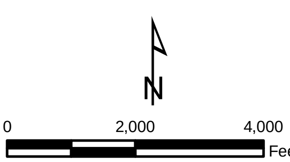
Table 3.4-18
Annual Average Daily Traffic on Highways in the Vicinity of the Project Area, 2010 and 2011[1]

Route and Highway Segment Description	Milepost		2010[1]		2011[2]	
	Start	End	All Vehicles	Trucks[3]	All Vehicles	Trucks[3]
Rawlins to Lander: US Highway 287/WY 789						
Jct US 30 Bus Rte & I-80 Bus Rte	0.197	1.187	4,746	311	4,870	356
Rawlins northern city limits	1.187	1.919	3,559	329	3,609	264
US Highway 287 Bypass	1.919	3.090	5,241	573	5,153	389
Rawlins northern urban limits	3.090	15.250	3,839	562	3,893	285
Union 76 Mine Road Junction	15.250	33.264	3,536	560	3,536	509
Junction WY 73 at Lamont	33.264	44.311	2,259	558	2,338	590
Muddy Gap Junction	0.000	6.412	901	124	790	107
Carbon – Fremont county line	6.421	6.518	960	124	946	107
Fremont – Natrona county line	6.518	7.917	960	124	946	107
Natrona – Fremont county line	7.917	22.410	960	124	946	107
Jeffrey City – east side	22.410	23.400	1,072	141	1,056	118
Jeffrey City – west side	23.400	41.900	958	141	958	118
Bison Basin Road	41.900	42.106	1,447	129	1,129	109
WY 135 Junction	42.106	46.340	872	129	755	109
Antelope Creek	46.340	54.129	842	124	842	108
Old Highway Junction	54.129	72.868	773	129	742	107
WY 28 Junction	72.868	74.440	1,686	358	2,186	315
Willow Creek Road Junction	74.440	79.230	3,409	368	2,682	325
Lander southern urban limits	79.230	80.195	5,617	368	4,498	329
Lander southern city limits	80.195	80.770	6,704	440	6,798	401
Sweetwater Junction to Riverton: WY 789 , WY 135 and WY 136						
WY State Highway 789						
WY 135 Junction	103.835	104.162	18,000	705	12,410	703
Riverton southern urban limits	104.162	104.308	19,000	754	13,792	749
Riverton southern city limits	104.308	105.169	19,126	758	16,086	753
WY State Highway 135						
WY 789 Junction	0.000	1.040	1,378	200	1,364	207
WY 136 Junction	1.040	7.351	857	120	847	129
Wind River Indian Reservation	7.351	8.850	739	100	731	111
Route Road 524 West Junction	8.850	17.577	583	97	488	74
WY139 Junction	17.577	34.590	570	95	464	71
WY State Highway 136						
WY 135 Junction	1.038	12.123	225	38	222	34
Muddy Gap to Casper: WY 220						
Muddy Gap	44.311	57.014	1,825	534	1,894	563
Carbon –Natrona county line	57.014	65.674	1,825	534	1,894	563
Buzzard Road Junction	65.674	80.660	2,012	533	1,982	533
Pathfinder Road Junction	80.660	84.660	2,286	591	2,281	591
Lake Shore Drive Junction	84.660	86.640	2,730	701	2,689	701
Kortes Road Junction	86.640	97.350	3,022	697	2,977	697
WY 487 Junction	97.305	102.905	3,579	688	3,567	689
Old Highway Junction	102.905	105.805	3,605	863	3.705	863
Goose Egg Road Junction	105.805	107.963	3,663	988	3,656	988
Casper southern urban limits	107.963	108.060	4,854	988	4,902	988

[1] WYDOT, 2011.
[2] WYDOT, 2012a.
[3] For purposes of reporting AADT, the WYDOT defines a truck as any vehicle larger than a pick-up (Wiseman, 2014).



Map 3.4-2
Existing Roads within the Project Area



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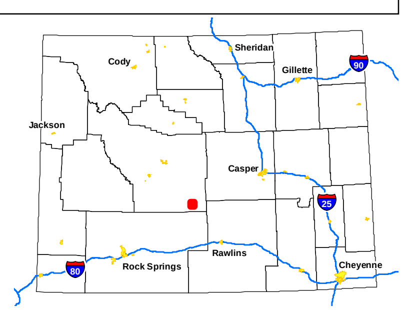
Sheep Mountain Project Area
Existing Roads



3.4.6.4 Traffic Crashes

Table 3.4-19 shows the number of traffic crashes involving property damage, injuries, and fatalities in Carbon, Fremont, and Natrona counties between 2005 and 2012 (incomplete data are available for 2008 and 2010). Crash data were obtained from the WYDOT, and include traffic crash reports submitted by all levels of Wyoming law enforcement.

Table 3.4-19
Traffic Crashes by Type for Fremont, Carbon and Natrona Counties, 2005 - 2011[1]

Year	Crash Type	Carbon County	Fremont County	Natrona County
2005	PDO[2]	575	680	1,852
	Injury	209	243	598
	Fatal	5	13	11
2006	PDO[2]	689	625	1,796
	Injury	202	246	635
	Fatal	13	19	10
2007	PDO[2]	724	743	1,935
	Injury	238	234	625
	Fatal	8	15	10
2008	PDO[2]	NR[3]	NR[3]	NR[3]
	Injury	NR[3]	NR[3]	NR[3]
	Fatal	6	18	13
2009	PDO[2]	526	693	1,898
	Injury	136	219	582
	Fatal	7	20	11
2010	PDO[2]	NR[3]	NR[3]	NR[3]
	Injury	NR[3]	NR[3]	NR[3]
	Fatal	15	12	8
2011	PDO[2]	569	705	1,727
	Injury	127	171	504
	Fatal	8	11	13
2012[4]	PDO[2]	552	666	1,763
	Injury	137	194	432
	Fatal	7	9	10

[1] Source: WYDOT, 2013.
[2] PDO = property damage only.
[3] NR = Not Reported.
[4] Source: WYDOT, 2014.

Fatality rate data compiled by the National Highway Traffic Safety Administration (NHTSA) provide additional information on fatal traffic crashes. Table 3.4-20 shows the number of highway fatalities and highway fatality rates (expressed as fatalities per million vehicle miles traveled) in urban and rural areas of Wyoming between 2008 and 2012. The NHTSA classifies geographic areas as rural or urban as defined by the Census Bureau. Urban areas identified by the Census Bureau contain urbanized areas of 50,000 or more people and urban clusters of at least 2,500 and less than 50,000 people. Rural areas include all population, housing, and territory not included within an urban area.

Table 3.4-20
Wyoming Highway Fatalities and
Fatality Rates per Million Vehicle Miles Traveled, 2005 - 2011[1]

Traffic Safety Measure	2008	2009	2010	2011	2012
Traffic Fatalities					
Urban	22	19	22	38	22
Rural	137	115	133	97	101
Total	159	134	155	135	123
Fatalities per 100 Million Vehicle Miles Driven					
Urban	0.83	0.71	0.80	1.39	0.77
Rural	2.02	1.67	2.01	1.49	1.57
Total	1.68	1.40	1.66	1.46	1.33

[1] Source: NHTSA, 2013.

3.4.6.5 Off Site Processing at the Sweetwater Mill

If processing occurred at the Sweetwater Mill, ore-hauling trucks would travel approximately 26 miles south of the Project Area on Crooks Gap/Wamsutter Road (Fremont CR 318 and Sweetwater County CR 4-23) to Mineral Exploration Road (Sweetwater CR 4-63). Project traffic would exit east onto Mineral Exploration Road and continue approximately 4 miles to the Sweetwater Mill entry road. From the mill, the processed product would travel approximately 20 miles east on Mineral Exploration Road to the Carbon County line and continue approximately 10 miles east on BLM Road 3206 to access US Highway 287 north of Rawlins. Weather permitting, trucks hauling drums leaving the Sweetwater Mill could also travel 22 miles south on Crooks Gap/Wamsutter Road to access Interstate-80 at Wamsutter. Workers might also use Bairoil Road (Sweetwater CR 4-22) to access the Sweetwater Mill from Bairoil.

In their comment letter on the Preliminary Draft EIS dated February 23, 2015 Sweetwater County summarized the current condition of Crooks Gap/Wamsutter Road (4-23), Minerals Exploration road (4-63), and the Bairoil Road (4-22):

- Crooks Gap/Wamsutter Road (4-23) – The portion of the Crooks Gap/Wamsutter Road located north of the Luman Road (4-23) is currently a county dirt road that receives winter maintenance by agreement with UR Energy and the Lost Creek Mine. Through this cooperative agreement, UR Energy and Sweetwater County have upgraded a portion of this road section to an improved gravel road that will accommodate a moderate number of light weight vehicles on a daily basis and a few heavy haul vehicles on a weekly basis.
- Minerals Exploration Road (4-63) – The Minerals Exploration Road is currently a paved road from US Highway 287 to the Sweetwater Mill. Within Sweetwater County, the paved surface of this road is in poor condition and receives only occasional maintenance. Within Carbon County, the BLM portion of this road has weight restrictions that limit the use of this road as a haul road for heavy trucks.
- Bairoil Road (4-22) – Due to the presence of large stones and cobble and the sandy nature of the road base and substrate, the Bairoil Road is in very poor condition and is extremely difficult to maintain.

Fremont County and Sweetwater County provide winter maintenance on their respective portions of Crooks Gap/Wamsutter Road and Sweetwater County provides winter maintenance on Minerals Exploration Road; however, county maintenance crews do not plow these roads during periods of inclement winter weather. Sweetwater County does not maintain Bairoil Road in the winter. The BLM provides minimal maintenance on BLM Road 3206. The Sweetwater Mill has a BLM right-of-way on this route and conducts periodic roadway maintenance as part of its right-of-way agreement.

3.4.7 Public Health and Safety

Public health and safety includes the potential exposure of the public and workers to radioactivity, generation of solid waste, and transportation and use of hazardous materials. The following section describes the kinds of radioactive materials that would be generated through ore processing and radioactive background that could be encountered on-site from past mining activities. It also provides a discussion of the regulatory framework of how various hazardous materials and solid wastes are defined under numerous programs.

3.4.7.1 Exposure to Radioactive Materials

Radioactive exposure is measured by a quantity called the roentgen and is a measurement of the ionization of molecules in a given mass of air by gamma rays or x-rays. A unit called the roentgen equivalent man (rem) is used to relate the radiation exposure to potential live tissue damage since different kinds of radioactivity can cause different effects even for the same amount of absorbed radiation. The rem is often expressed in terms of millirem (mrem).

The annual natural background radiation exposure to U.S. residents varies by location and elevation but is about 360 mrem per year (mrem/yr) (NRC, 2013). The average U.S. resident also receives additional radiation exposure from manmade sources such as medical tests and consumer products. Table 3.4-21 compares various radiation exposures from activities or exposure thresholds.

Table 3.4-21
Comparative Doses of Radiation

Activity or Limit	Dose
Annual natural background radiation in U.S.	360 mrem
Flying 3,000 miles	3 mrem
Chest x-ray	10 mrem
CT scan	500 – 1,000 mrem
Annual whole body limit for workers	5,000 mrem
Annual thyroid limit for workers	50,000 mrem
Radiation sickness (Acute Radiation Syndrome)	100,000 mrem whole body
Erythemia (skin reddening)	500,000 mrem to skin
Source: BLM, 2013b.	

Background doses of radiation typically are a function of elevation change. An increase in elevation correlates to an increase in the exposure to cosmic radiation. The average cosmic radiation in the Project Area is expected to be greater than the national average due to its higher elevation. The average natural and manmade radiation dose for the State of Wyoming is 316 mrem/yr, lower than the U.S. average. This is attributable to a lower Wyoming average radon dose, 133 mrem/yr, than the U.S. average of 200 mrem/yr (EPA, 2005).

The principal radiological parameters of concern, based on potential health effects, are radium-226 and its immediate daughter product radon-222. Because radon is a gas which readily disperses in an open air environment, the radiological parameter most commonly evaluated in soils and/or mine spoils is radium-226. As radioactive materials by definition decay and emit radioactive particles and/or energy, the general levels of radioactivity can readily be measured by passive detection devices. Naturally occurring uranium results in the formation of radon-222, a radioactive gas. Radon gas is formed through the radioactive decay of uranium. Uranium and radon are ubiquitous in the U.S. although concentrations vary regionally and depend on the amount of uranium present in the soil, rocks, and water (EPA, 2012). The presence of radon is dependent on the type, porosity, and moisture content in the soil and/or bedrock.

As provided in Section 3.2.1 (Climate and Air Quality), passive gamma dose rate and radon measuring devices were co-located with nine air particulate monitoring stations. Monitored results indicate relatively low radio particulate concentrations in air across the site (Titan Uranium, 2011).

As provided in Section 3.2.4 (Soils), a report for the Project Area was completed summarizing the baseline gamma levels and commensurate radium-226 levels in the soils (WDEQ, 2015a).

In general, the Project Area shows relatively high radiological background gamma due to both NORM and TENORM concentrations of Radium 226 and other radionuclides in the near surface soils. Elevated NORM is due to outcropping of mineralization. Elevated TENORM reflects the more than 30 years of historical mining and exploration in the vicinity.

Radiation exposure limits are specified in 10 CFR § 20. Both the Occupational Safety and Health Administration (OSHA) and the NRC, through an MOU, have jurisdiction over occupational safety and health at NRC-licensed facilities (OSHA, 1988).

3.4.7.2 Wastes, Hazardous or Solid

Solid Waste

Solid waste consists of a broad range of materials that include garbage, refuse, wastewater treatment plant sludge, non-hazardous industrial waste, and other materials (solid, liquid, or contained gaseous substances) resulting from industrial, commercial, mining, agricultural, and community activities. Solid wastes are regulated under different subtitles of the Resource Conservation and Recovery Act (RCRA) and include hazardous waste and non-hazardous waste and certain radioactive wastes.

Hazardous Materials (Non-Radioactive)

Hazardous materials, which are defined in various ways under a number of regulatory programs, can represent potential risks to both human health and the environment when not properly managed. The term 'hazardous materials' includes the following materials that may be utilized or disposed of in construction and operation:

- Substances covered under OSHA Hazard Communication Standards (29 CFR § 1910.1200 and 30 CFR § 42): The standard covers many chemicals and substances commonly used at industrial worksites.
- "Hazardous materials" as defined under USDOT regulations at 49 CFR, §§ 170-177: The types of materials that may be used in construction and operational activities and that would be subject to these regulations would include, cement, fuels, some paints and coatings, and other chemical products.
- "Hazardous substances" as defined by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and listed in 40 CFR Table 302.4: The types of materials that may contain hazardous substances that would be subject to these requirements would include solvent-containing materials (e.g., paints, coatings, degreasers), acids, and other chemical products.
- "Hazardous wastes" as defined in the RCRA: Procedures in 40 CFR § 262 are used to determine whether a waste is a hazardous waste. Hazardous wastes are regulated under Subtitle C of RCRA.
- Any "hazardous substances" and "extremely hazardous substances" as well as petroleum products such as gasoline, diesel, or propane, that are subject to reporting requirements if volumes on-hand exceed threshold planning quantities under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act (SARA): The types of materials that may be used in construction and operational activities and that could be

subject to these requirements would include fuels, coolants, acids, and solvent-containing products such as paints and coatings.
- Petroleum products defined as "oil" in the Oil Pollution Act of 1990: The types of materials that would be subject to these requirements include fuels, lubricants, hydraulic oil, and transmission fluids.

In conjunction with the definitions noted above, the following provides information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- The SARA Title III List of Lists or the Consolidated List of Chemicals Subject to Emergency Planning and Community Right-to-Know Act and Section 112(r) of the Clean Air Act.
- The USDOT listing of hazardous materials in 49 CFR § 172.101.

Certain types of materials, while they may contain potentially hazardous constituents, are specifically exempt from regulation as hazardous wastes. Used oil, for example, may contain toxic metals, but would not be considered a hazardous waste unless it meets certain criteria. Other wastes that might otherwise be classified as hazardous are managed as “universal wastes” and are exempted from hazardous waste regulation as long as those materials are handled in ways specifically defined by regulation. An example of a material that could be managed as a universal waste is lead-acid batteries. As long as lead-acid batteries are recycled appropriately, requirements for hazardous waste do not apply.

Radioactive Waste

The remaining waste products following the extraction and recovery of uranium from ore through processing operations are classified as “11(e)(2) byproduct material.” According to Section 11(e)(2) of the AEA (as revised in 1978 and in 2005 by the Energy Policy Act), byproduct material is defined as “the tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.” Byproduct material is not considered a hazardous waste under EPA regulations. To be a hazardous waste, material must first be classified as a solid waste by EPA. Under the RCRA regulation 40 CFR § 261.4(a)(4), source, special nuclear, or byproduct material as defined by the AEA is excluded from the definition of solid waste.

The NRC and states under agreement with the NRC regulate the disposal of byproduct material. The NRC licenses commercial facilities that handle or use radioactive materials including nuclear power reactors, non-power research, test and training reactors, fuel cycle facilities, medical, academic, and industrial uses of nuclear materials; and the transport, storage, and disposal of nuclear materials and waste. The NRC is also responsible for developing, implementing, and enforcing NRC licensing criteria.

3.5 LAND RESOURCES

3.5.1 Recreation

Typically, the BLM describes the recreational setting based on three main factors: the character of the natural landscape (Physical Setting), the character of recreation and tourism use (Social Setting); and how public land agencies, county commissioners, the private sector, and open-space administrators manage the area (Administrative Setting). The factors combine as descriptors of the recreation environment that can result in a spectrum of recreation settings ranging from primitive or pristine to urban.

The Project Area and vicinity provides opportunities for primarily the local public to experience recreational activities in a highly modified front-country setting. While not urban, the high level of existing disturbance in terms of roads and trails, pits and other developments, represent uncharacteristically modified recreational opportunities.

Hunters have historically used the road–trail network in the area that exists from previous mining operations. Western Nuclear Pond to the south of the Project Area is used by the local community for fishing.

The Project Area coincides with two pronghorn hunt areas (HA 68-Split Rock north and HA 61-Chain Lakes south) and one hunt area each for mule deer (HA 96-Green Mountain), elk (HA 24-Green Mountain), and moose (HA 39-Jeffrey City). In addition to monitoring big game harvests, the WGFD documents the numbers of hunters, hunter success, number of days spent by hunters during the hunt season (hunter days), and average time to harvest each animal (days per harvest) within each hunt area each year. The moose hunt area has been closed to hunting for the past 10 years, 2003 to 2012 but harvest and recreational use of hunt areas for the big game species is documented in Table 3.5-1. The data summarized for the past 10 years indicate that numbers of pronghorn, mule deer, and elk hunters in the Project Area have been increasing. Mule deer hunters spent the most recreational time in the area in part due to their increasing numbers but also because they averaged more time to harvest a deer each year than pronghorn and elk hunters. As noted in Section 3.3.5.1 under Wildlife, the Sweetwater mule deer population and Green Mountain elk population have been increasing over the past 20 years and, if the trends continue, recreational harvests of those species is likely to continue increasing in the vicinity of the Project Area. However, the recent declining population trend of the Beaver Rim pronghorn population does not appear to have affected hunter use of HA 68.

Table 3.5-1
Hunter Recreation Use of Big Game Hunt Areas that Coincide with the Project Area

Big Game Species and Hunt Area	10-year Average Number of Hunters (10-year Trend)	10-year Average % Hunter Success (10-year Trend)	10-year Average Hunter Days (10-year Trend)	10-year Average Days per Harvest (10-year Trend)
Pronghorn				
HA 68	427 hunters (increasing)	96.0 percent (no trend)	1,267 hunter days (increasing)	3.0 (increasing)
HA 61	250 hunters (no trend)	93.9 percent (no trend)	627 hunter days (no trend)	2.7 (no trend)
Mule Deer				
HA 96	624 hunters (increasing)	40.0 percent (no trend)	2,219 hunter days (increasing)	10.8 days (no trend)
Elk				
HA 24	359 hunters (increasing)	56.5 percent (decreasing)	1,952 hunter days (increasing)	9.8 days (increasing)
Sources: WGFD. 2003 to 2012.				

The vicinity of the Project Area is also used for recreational harvest of upland game birds in 2012 including mourning dove, ruffed grouse, chukar, blue grouse, gray partridge, and greater sage-grouse. Small game hunters potentially use the Project Area vicinity, primarily to harvest cottontail rabbits and possibly squirrels. Various furbearers (bobcat, badger, beaver, mink, and muskrat) may also be trapped in the area although furbearer harvest is more limited than recreational harvest of upland game birds and small game mammals.

The social recreation setting in the area is demonstrating an urbanizing trend or movement towards more modified recreation settings due to existing mineral development, transmission lines, increased pipelines, and compressor stations.

No developed recreation sites exist in or near the Project Area. The closest developed sites are on Green Mountain and consist of county- and BLM-maintained camping areas and upgraded access roads. Informal camping occurs around the Project Area and vicinity during hunting seasons.

3.5.2 Livestock Grazing

The Project Area coincides with two grazing allotments (see Map 3.5-1). The Mountain Allotment consists of approximately 36,286 acres, and the Project Area coincides with 2,976.93 of those acres (or less than 10 percent of the allotment). The Crooks Gap Allotment consists of approximately 3,410 acres, and the Project Area coincides with 634.36 of those acres (or less than 20 percent of the allotment).

There are no range infrastructure projects in the Project Area associated with livestock grazing although approximately 1.67 miles of fencing are found in the Project Area erected to protect mine properties or by the Abandoned Mine Lands Program. These fences are shown on Map 3.5-1.

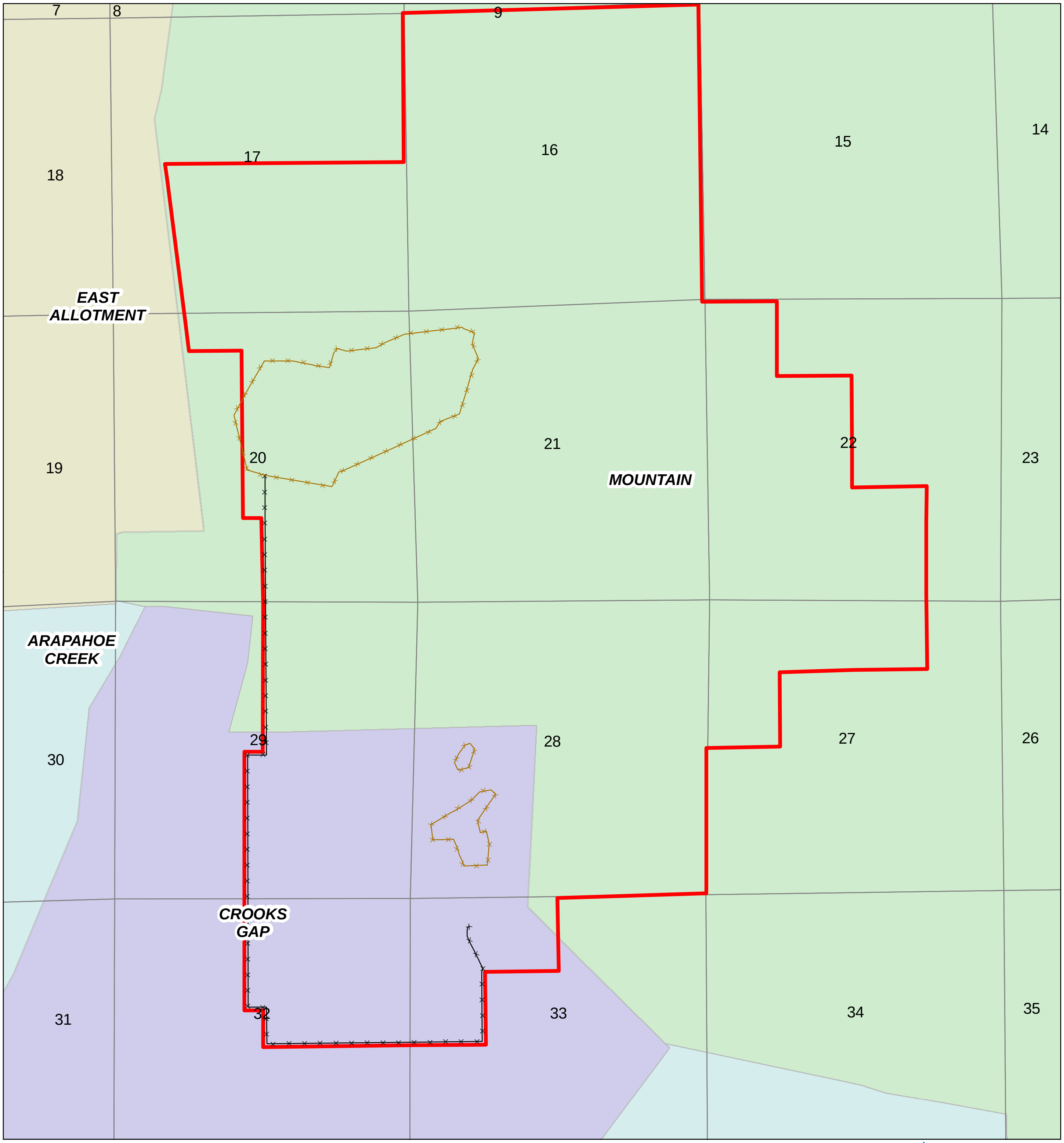
The BLM authorizes livestock grazing by season of use and by livestock numbers (AUMs), which represent the use of rangelands by a cow/calf pair for one month. The Mountain Allotment was formerly part of a larger allotment which was typically grazed from May to November. It is likely that this usage will be carried forward with authorized AUMs based on available forage. The Mountain Allotment is too new to have average usage.

The Crooks Gap Allotment portion of the Project Area has a season of use from October 1 to November 30th for 83 AUMs on public lands.

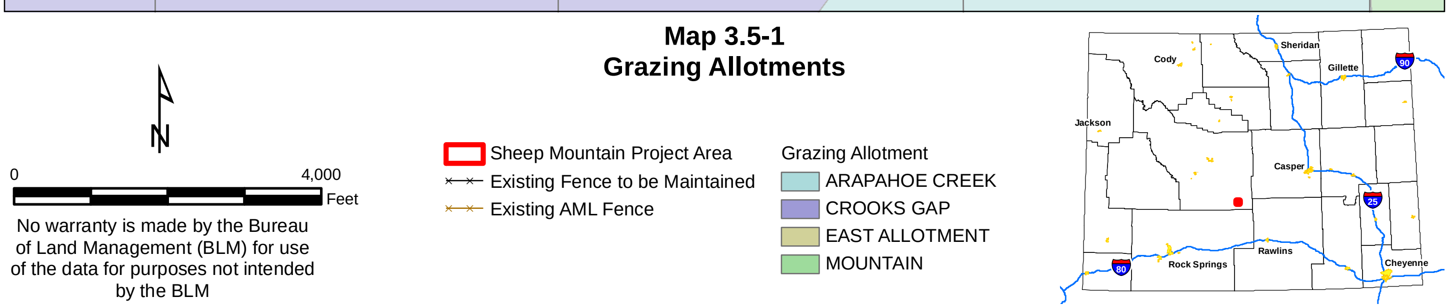
The range condition of the Crooks Gap Allotment portion of the Project Area does not vary meaningfully from the Mountain Allotment portion (Likins, 2012). Rangeland health was last assessed in this area in 1999 and was determined not to meet standards because of livestock grazing, primarily in riparian areas. A series of corrective actions for the area in general have been implemented but not in any way for the portions of the allotments in the Project Area.

The Lander Field Office has implemented a “block” approach to conducting rangeland health assessments. The two allotments coinciding with the Project Area are not currently scheduled for new assessments but the BLM’s goal is to conduct health assessments as part of livestock grazing permit renewals. While permits are issued for a ten-year period, BLM staffing does not always support doing rangeland health assessments in that timeframe. It is not possible to speculate as to what standards assessment would identify as current range condition (see Section 3.3.2, Vegetation).

The contribution of the rangeland in the Project Area to livestock grazing is minor and not proportionate to the acres. Because of existing surface disturbance or lack of vegetation associated with earlier mining operations and inhospitable terrain with steep slopes and limited water sources, the unfenced portions of the Project Area have a low carrying capacity. The fenced portions exclude livestock and thus do not contribute at all to the allotments. A formal ecological site inventory or carrying capacity has not been done in some decades and not since the last two severe droughts. However, BLM range specialists have analyzed the vegetation of the area coupled with other factors including slope and determined that the unfenced portions of the allotment would support livestock grazing at 40 acres per AUM (Bryan, 2013).



Map 3.5-1
Grazing Allotments



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

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Chapter 4.0
Environmental Consequences

4.1 INTRODUCTION

This chapter describes the probable consequences of each alternative on the human and natural environmental resources that could be affected and presents comparative analyses of the direct and indirect effects on the environment. Environmental impact analysis is based upon available data and literature from state and federal agencies, peer-reviewed scientific literature, and resource studies conducted in the Project Area.

Within each resource, evaluation of impacts is intended to provide an impartial assessment to help inform the decision-maker and the public. Actions resulting in adverse impacts to one resource may impart a beneficial impact to other resources. In general, adverse impacts described in this section are considered important if they result from, or relate to, the implementation of any of the alternatives. These impacts are defined as follows:

- **Direct impacts** – Impacts that are caused by the action and that occur at the same time and in the same general location as the action.
- **Indirect impacts** – Impacts that occur at a different time or in a different location than the action to which the impacts are related.
- **Short or long-term impacts** – When applicable, the short-term or long-term aspects of impacts are described. For the purposes of this EIS, short-term impacts occur during or after the activity or action and may continue for up to 2 years. Long-term impacts occur beyond the first 2 years.

Each resource section includes a discussion of the issues raised during public scoping, internal scoping, and/or during the public comment period on the Draft EIS, followed by the direct and indirect impacts of each alternative. The impact analysis for the Proposed Action is split into two separate analyses, on-site processing and off-site processing, because these two scenarios under the Proposed Action are unique in their associated impacts and require a separate analysis. Analysis of the on-site processing option includes the analysis of impacts associated with the Mine and the On-Site Ore Processing Facility. Analysis of the off-site processing option assumes that the impacts would be similar to the on-site processing option in general except where noted. This analysis is considered conservative because Energy Fuels would develop the Mine under either processing scenario, but could choose either on-site processing or off-site processing (not both). The cumulative impacts associated with each alternative, when added to past, present, and reasonably foreseeable future activities, are discussed in Chapter 5.0.

The Plan of Operations as submitted by Energy Fuels (Energy Fuels, 2015a) meets BLM's completeness requirements at 43 CFR § 3809.401. Therefore, the analysis presented herein describes the impacts of the implementation of the complete Plan of Operations in order to determine whether or not the Plan of Operations would result in unnecessary or undue degradation of public lands in accordance with 43 CFR § 3809.5. If additional information becomes available prior to the ROD for this EIS, it will be incorporated into the analysis to the best extent possible. The BLM AO for this Project will determine whether additional scoping or public comment is necessary as a result of these changes. If additional information becomes available after the ROD that requires a modification to the Plan of Operations, the appropriate level of NEPA will be completed as determined by the AO.

As a note: the NRC has jurisdiction over the processing of uranium ore into yellowcake and will prepare a separate NEPA document analyzing the On-Site Ore Processing Facility (i.e., Heap Leach Pad; Treatment Ponds; and Extraction and Precipitation and Packaging plants). While the information presented in the Plan of Operations meets BLM's requirements, the detailed schematics and engineered designs for the On-Site Ore Processing Facility will be better described in the license application to the NRC for that NEPA analysis. The BLM's authority is limited to determining whether the approach to uranium mining, processing, and reclamation selected by Energy Fuels would result in undue or unnecessary degradation of public surface. Therefore, the analysis conducted in this EIS considers both the on-site and off-site processing facilities as described in the Plan of Operations and assumes that all applicable NRC regulations will be adhered to and followed by Energy Fuels, but the analysis is specific to BLM's resource management expertise. It is the NRC's responsibility to ensure that the processing facilities meet the applicable laws and regulations governing radiological impacts. Therefore, the analysis presented herein utilizes the most up to date information available such as the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and Energy Fuels' Plan of Operations (Energy Fuels, 2015a) summarized in Chapter 2 as a basis for analysis of the Proposed Action. Additionally, the analysis assumes that all permits currently held by Energy Fuels are adhered to including the WDEQ-LQD Mine Permit 318C, WDEQ-WQD WYPDES Permit WY0095702, and SWPPP. Therefore, it would be inappropriate for BLM to assume in the impact analysis that the measures in these permits fail or are not adhered to resulting in adverse impacts.

4.2 PHYSICAL RESOURCES

4.2.1 Climate and Air Quality

4.2.1.1 Proposed Action

An air quality modeling analysis was performed to assess the impacts on ambient air quality and AQRVs from potential air emissions due to the Proposed Action. Both near-field and far-field air quality analyses were performed for each analyzed scenario: Construction, Operations with on-site processing, and Operations with off-site processing. Potential ambient air quality impacts for each scenario were quantified and compared to applicable state and federal ambient air quality standards and PSD increments. AQRV impacts (impacts on visibility, atmospheric deposition and potential increases in acidification to acid-sensitive lakes) were determined and compared to applicable thresholds. The Sheep Mountain Uranium Project Air Quality Technical Support Document (AQTSD – Appendix 4-A) provides a complete summary of the Project emissions inventories and modeling analyses.

Near-Field Modeling

A near-field ambient air quality impact assessment evaluates maximum pollutant impacts within and near the Project Area resulting from Construction and Operations. EPA's Guideline (EPA, 2005) model, AERMOD (version 13350), was used to assess these near-field impacts. The near-field modeling used two years of meteorological data collected on-site during 2011 and 2012.

The near-field criteria pollutant assessment was performed to estimate maximum potential impacts of CO, NO_2, SO_2, PM_{10} and $PM_{2.5}$. Impacts were assessed from three scenarios: mine and processing plant construction, mine operations with the On-Site Ore Processing Facility, and mine operations with ore processed off-site at the Sweetwater Mill. Hazardous Air Pollutant (HAPs) emissions of benzene, toluene, ethyl benzene, xylene, n-hexane, and formaldehyde would be emitted primarily through mobile source fuel combustion, and due to the quantity of these pollutants emitted, ambient impacts were not analyzed.

Mine construction modeling analyzed impacts from underground blasting and construction, mine intake air heaters, surface dozing, overburden removal and overburden unloading (similar to surface mining activity occurring during Operations), facilities construction, unpaved road travel, wind erosion of open acres and stockpiles, and mobile source fuel combustion. Operations modeling (both on-site processing and off-site processing) included underground blasting, mine intake air heaters, primary crushers, conveyor transfers, surface dozing, product removal, overburden removal, and unloading of product and overburden, radial stacker transferring material to the leach pad, the yellowcake production facility (on- or off-site), unpaved road travel, wind erosion of open acres and stockpiles, mobile source fuel combustion, and shop, plant, and office heating. The Operations case for off-site ore processing at the Sweetwater Mill also includes the hauling of ore by truck to the mill and an additional stockpile at the mill.

The three cases analyzed utilized pollutant emission rates calculated based on maximum throughput and activity rates. The modeled cases assumed a mine configuration representative of Year 3, which had the second highest amount of material excavated (2 percent less than the maximum) as well as mining activities in close proximity to the northern and eastern boundaries. Short-term emission rates were used to quantify concentrations for short-term averaging periods. Model receptors were placed at and beyond the ambient boundary following accepted guidance, with terrain elevations for each receptor developed using the AERMAP processor along with available digital elevation model data.

Far-Field Modeling

A far-field ambient air quality impact assessment quantified potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_X, SO_2, PM_{10} and $PM_{2.5}$ expected to result from the Proposed Action. Ambient air quality impacts of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ and AQRVs were analyzed at far-field federal Class I and sensitive Class II areas located within 200 km of the Project Area. The Class I areas located within 200 km of the Project Area include the Bridger Wilderness Area, Fitzpatrick Wilderness Area, and Mount Zirkel Wilderness Area. Class II areas within 200 km of the Project Area that are considered sensitive areas include the Popo Agie Wilderness Area, Savage Run Wilderness Area, and Wind River Roadless Area. Ten lakes that are designated as acid sensitive including Black Joe, Deep, Hobbs, Lazy Boy, and Upper Frozen lakes in the Bridger Wilderness; Ross Lake in the Fitzpatrick Wilderness; Lake Elbert, Seven Lakes, and Summit Lake in the Mount Zirkel Wilderness; and Lower Saddlebag Lake in the Popo Agie Wilderness Area were assessed for potential lake acidification from atmospheric deposition impacts.

The far-field analyses used the EPA-approved version of the CALPUFF modeling system (Version 5.8.4) along with a windfield developed for year 2008 using the Mesoscale Model Interface Program (MMIF) Version 3 (ENVIRON, 2013) and the 2008 Weather Research and Forecasting (WRF) meteorological model output that was produced as part of the Western Regional Air Partnership's (WRAP) West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) (ENVIRON et al., 2012).

The far-field analysis assessed impacts from Construction, Operations with on-site processing, and Operations with off-site processing, utilizing maximum emission rates.

Impact Significance Criteria. Air quality impacts from pollutant emissions are limited by regulations, standards, and implementation plans established under the Federal Clean Air Act, as administered by the WDEQ-AQD under authorization of the EPA. Under FLPMA and the Clean Air Act, the BLM cannot conduct or authorize any activity which does not conform to all applicable local, state, tribal, or federal air quality laws, statutes, regulations, standards or implementation plans. As such, significant impacts to air quality from Project-related activities would result if it is demonstrated that:

- NAAQS or WAAQS would be exceeded; or
- AQRVs would be impacted beyond acceptable levels.

All NEPA analysis comparisons to the PSD Class I and II increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is an air quality regulatory agency responsibility. Such an analysis would be conducted to determine minor source increment consumption or, for major sources, as part of the New Source Review process. The New Source Review process would also include an evaluation of potential impacts to AQRVs such as visibility, aquatic ecosystems, flora, fauna, etc. performed under the direction of federal land managers.

Emission Inventory Development. Air pollutant emissions would result from Construction and Operations. The primary pollutants emitted during Construction would be PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, volatile organic compounds (VOCs), and HAPs including benzene, toluene, ethyl benzene, n-hexane and formaldehyde. These activities would temporarily elevate pollutant levels, but impacts would be localized and would occur only for the short-term during Construction. Mechanically-generated fugitive dust emissions (PM_{10} and $PM_{2.5}$) would result from material movement and travel on unpaved roads. Wind-blown fugitive dust emissions would also occur from open and disturbed land during Construction.

Emissions from Construction were quantified using accepted methodologies, including manufacturer's emission factors, EPA emission factors and standards, and engineering estimates. Maximum annual mine-wide criteria pollutant and HAPs emissions resulting from mine and processing plant construction are shown in Table 4.2-1. The total HAPs emissions include benzene, toluene, ethyl benzene, n-hexane, and formaldehyde emissions of 0.4807, 0.2845, 0.0588, 0.1005, and 6.14 tons per year (tpy), respectively.

Table 4.2-1
Construction Emissions

	Tons Per Year						
Activity	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**VOC**	**HAPs**
Underground Activity	2.64	2.57	48.52	67.04	0.60	5.14	0.98
Surface Activity	13.19	5.03	--	--	--	--	--
Unpaved Roads	12.78	1.28	--	--	--	--	--
Wind Erosion	12.71	1.91	--	--	--	--	--
Surface Mobile Sources	1.99	1.99	199.03	119.63	0.27	14.02	6.08
Maximum Annual Emissions	**43.31**	**12.78**	**247.55**	**186.67**	**0.87**	**19.16**	**7.06**

During mining, the primary pollutants emitted would be PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2, VOCs, and HAPs including benzene, toluene, ethyl benzene, n-hexane and formaldehyde. Operations on the surface, underground, and at the processing facility would result in increased pollutant emissions over the life of the Project. Mechanically-generated fugitive dust emissions (PM_{10} and $PM_{2.5}$) would result from overburden and ore removal, material transfers, crushing, overburden and ore haulage on unpaved roads and support and delivery vehicles on unpaved roads. Wind-blown fugitive dust emissions would also occur from open and disturbed land, including topsoil stockpile areas, the ore stockpile, the Hanks Draw and South spoils piles, and other open, disturbed areas.

Emissions from Operations were quantified using accepted methodologies, including manufacturer's emission factors, EPA emission factors and standards, and engineering estimates. Maximum annual mine-wide criteria pollutant and HAPs emissions resulting from mining with an on-site processing facility are shown in Table 4.2-2. Table 4.2-3 shows annual criteria pollutant and HAPs emissions from mining with ore processing occurring off-site at the Sweetwater Mill. The total HAPs emissions for Operations with on-site processing include benzene, toluene, ethyl benzene, n-hexane, and formaldehyde emissions of 0.335, 0.218, 0.042, 0.069, and 4.48 tpy, respectively.

Table 4.2-2
Annual Emissions - Operations with On-Site Processing

	Tons/Year						
Activity	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**VOC**	**HAPs**
Underground Activity	2.81	2.59	48.52	67.04	0.60	5.14	0.98
Surface Activity	77.83	16.92	0.89	0.65	0.02	41.77	0.0037
Unpaved Roads	88.42	8.84	--	--	--	--	--
Wind Erosion	58.55	8.78	--	--	--	--	--
Surface Mobile Sources	1.24	1.24	136.65	80.41	0.18	9.48	4.16
Total Emissions	**228.85**	**38.37**	**186.06**	**148.10**	**0.80**	**56.39**	**5.14**

Table 4.2-3
Annual Emissions - Operations with Off-Site Processing

	Tons/Year						
Activity	**PM_{10}**	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_2**	**VOC**	**HAPs**
Underground Activity	2.81	2.59	48.52	67.04	0.69	5.14	0.98
Surface Activity	77.83	16.92	0.89	0.65	0.02	41.77	0.0037
Unpaved Roads	114.07	11.40	--	--	--	--	--
Wind Erosion	59.45	8.92	--	--	--	--	--
Surface Mobile Sources	1.29	1.29	151.66	89.09	0.20	10.48	4.23
Total Emissions	**255.45**	**41.12**	**201.07**	**156.78**	**0.91**	**57.39**	**5.21**

Greenhouse Gases

As part of the development of the Proposed Action emission inventory, emissions of the greenhouse gases CO_2, CH_4, and N_2O from Project sources were quantified for Construction and Operations, expressed as CO_2e. Calculating emissions as CO_2e allows for the comparison of emissions from different greenhouse gases based on their Global Warming Potential (GWP). GWP is defined as the cumulative radiative forcing of a gas over a specified time horizon relative to a reference gas resulting from the emission of a unit mass of gas. The reference gas is taken to be CO_2. The CO_2e emissions for a greenhouse gas are derived by multiplying the emissions of the gas by the associated GWP. The GWPs for the inventoried greenhouse gases are CO_2:1, CH_4:21, N_2O:310 (EPA, 2011b). Calculated CO_2e emissions for Construction and Operations with on-site and off-site processing are shown in Table 4.2-4.

Table 4.2-4
GHG Emissions (metric tons per year)

Pollutant	**Construction**	**Operations (with on-site processing)**	**Operations (with off-site processing)**
CO_2e	11,089	11,304	12,437

4.2.1.1.1 Impacts with On-Site Processing

Near-Field Modeling

Air pollutant dispersion modeling quantifies maximum potential PM_{10}, $PM_{2.5}$, NO_x, CO, SO_2 impacts from Construction and Operations with on-site processing. AERMOD was used to model the maximum potential emissions of PM_{10}, $PM_{2.5}$, NO_x, CO and SO_2 that could occur from each of these scenarios, with maximum short-term emission rates utilized in all short-term modeling. Table 4.2-5 presents the modeled air pollutant concentrations that could occur for Construction and Table 4.2-6 presents the modeled air pollutant concentration that would occur for Operations with on-site processing. Because Construction is a temporary activity, in Table 4.2-5 the modeled concentrations are only compared to the ambient air quality standards and are not compared to the Class II increments. In Table 4.2-6, the modeled concentrations are compared to both the ambient air quality standards and the Class II increment because the Operations sources include more permanent stationary point sources; however, the increment demonstration is for informational purposes only and does not constitute a regulatory PSD increment consumption analysis.

When the concentrations from the modeled scenarios are added to representative background concentrations, it is demonstrated that total ambient air concentrations are less than the applicable NAAQS and WAAQS. The direct modeled concentrations are below all applicable PSD Class II increments except 24-hour PM_{10} and $PM_{2.5}$. The 24-hour PM_{10} and $PM_{2.5}$ impacts are controlled by fugitive sources like the mining pit and roads associated with Operations.

Potential ozone impacts resulting from this Project and other regional emissions have been predicted as part of the Continental Divide-Creston (CD-C) EIS (BLM, 2016b) and are discussed further in Chapter 5.

Table 4.2-5
Modeled Pollutant Concentration Impacts for Construction (µg/m³)

Pollutant	Averaging Period	Direct Modeled	Background	Total Predicted	NAAQS	WAAQS
CO	1-hour 8-hour	1,048.1[1] 266.7[1]	904.0 572.0	1,952.1 838.7	40,000 10,000	40,000 10,000
NO_2	1-hour Annual	163.0[2] 10.5[3]	9.4 1.9	172.4 12.4	188 100	188 100
SO_2	1-hour 3-hour	6.3[4] 5.0[1]	18.3 18.3	24.6 23.3	196 1,300	196 1,300
PM_{10}	24-hour Annual	47.5[1] 2.1[3]	49.0 11.0	96.5 13.1	150 --	150 50
$PM_{2.5}$	24-hour Annual	5.3[5] 0.4[3]	27.0 7.0	24.6 7.4	35 12	35 15

[1] Highest-second-high concentration.
[2] 3-year average of the 98th percentile daily maximum concentration based on 2 years of Construction impacts and 1 year of Operations impacts with off-site-processing.
[3] Maximum concentration.
[4] Maximum 99th percentile daily maximum concentration.
[5] Maximum 98th percentile concentration.

Table 4.2-6
Maximum Modeled Pollutant Concentration Impacts for Operations with On-Site Processing (µg/m^3)

Pollutant	Averaging Period	Direct Modeled	PSD Class II Increment [1]	Background	Total Predicted	NAAQS	WAAQS
CO	1-hour	1,048.1[2]	--	904.0	1,952.1	40,000	40,000
	8-hour	159.4[2]	--	572.0	731.4	10,000	10,000
NO_2	1-hour	137.9[3]	--	9.4	147.3	188	188
	Annual	8.0[4]	25	1.9	9.9	100	100
SO_2	1-hour	6.3[5]	--	18.3	24.6	196	196
	3-hour	3.3[2]	512	18.3	21.6	1,300	1,300
	24-hour	1.1[2]	91	--	--	--	--
	Annual	0.03[2]	20	--	--	--	--
PM_{10}	24-hour	33.4[2]	30	49.0	82.4	150	150
	Annual	4.9[4]	17	11.0	15.9	--	50
$PM_{2.5}$	24-hour	14.5[2]	9	--	--	--	--
	Annual	0.7[2]	4	--	--	--	--
$PM_{2.5}$	24-hour	4.3[6]	----	27.0	31.3	35	35
	Annual	0.7[4]		7.0	7.7	12	15

[1] The PSD demonstration serves informational purposes only and do not constitute a regulatory PSD increment consumption analysis.
[2] Highest-second-high concentration.
[3] 2-year average of the 98th percentile daily maximum concentration.
[4] Maximum concentration.
[5] Maximum 99th percentile daily maximum concentration.
[6] Maximum 98th percentile concentration.

Far-Field Modeling

Far-field modeling at Class I and sensitive Class II areas within 200 km of the Project Area was performed using the CALPUFF model to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_x, SO_2, PM_{10} and $PM_{2.5}$ expected to result from Construction and from Operations with on-site processing.

The Class I and sensitive Class II areas analyzed include the Bridger Wilderness Area, Fitzpatrick Wilderness Area, Mount Zirkel Wilderness Area, and Washakie Wilderness Area, all PSD Class I Areas, and the Popo Agie Wilderness Area, Savage Run Wilderness Area, and Wind River Roadless Area, all sensitive Class II areas.

The far-field assessment used the same maximum emissions scenarios and Year 3 modeling configuration as described in the Emissions Inventory Development section for Construction and Operations with on-site processing. The source locations, emissions, and parameters from the AERMOD files for each scenario were converted directly into CALPUFF format and coordinates to ensure consistency between the near-field and far-field analyses.

Class I and Sensitive Class II Areas

PSD Increment Comparison. The maximum direct modeled concentrations of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ at Class I and sensitive Class II areas resulting from either Construction or Operations is provided in Table 4.2-7 for comparison to PSD Class I and Class II increments. Note that although Construction sources are temporary and would not consume increment, for informational purposes, modeled construction impacts to PSD increments were included in the comparison.

As shown in Table 4.2-7, the maximum concentrations are well below the PSD Class I and Class II increments. The impacts from Construction and Operations are similar, with slightly higher impacts occurring at each sensitive area as a result of the emissions from Operations, with the exception of the SO_2 impacts at the Savage Run Wilderness Area which had maximum impacts associated with emissions from Construction. The PSD demonstrations are for information only and are not regulatory PSD Increment consumption analyses, which would be completed as necessary by the WDEQ-AQD.

Table 4.2-7
Maximum Modeled Pollutant Concentrations at PSD Class I and Sensitive Class II Areas (µg/m³) for Operations with On-Site Processing

Location	Pollutant	Averaging Time	Direct Modeled	PSD Increment
Bridger Wilderness Area	NO_2	Annual	0.0002	2.5
	SO_2	3-hour	0.0074	25
		24-hour	0.0009	5
		Annual	0.00001	2
	PM_{10}	24-hour	0.0237	8
		Annual	0.0004	4
	$PM_{2.5}$	24-hour	0.0080	2
		Annual	0.0002	1
Fitzpatrick Wilderness Area	NO_2	Annual	0.00001	2.5
	SO_2	3-hour	0.0002	25
		24-hour	0.00004	5
		Annual	0.000001	2
	PM_{10}	24-hour	0.0115	8
		Annual	0.0002	4
	$PM_{2.5}$	24-hour	0.0065	2
		Annual	0.0001	1
Mount Zirkel Wilderness Area	NO_2	Annual	0.0002	2.5
	SO_2	3-hour	0.0019	25
		24-hour	0.0002	5
		Annual	0.000004	2
	PM_{10}	24-hour	0.0154	8
		Annual	0.0005	4
	$PM_{2.5}$	24-hour	0.0088	2
		Annual	0.0003	1
Washakie Wilderness Area	NO_2	Annual	0.00001	2.5
	SO_2	3-hour	0.0001	25
		24-hour	0.0001	5
		Annual	0.000001	2
	PM_{10}	24-hour	0.0249	8
		Annual	0.0002	4
	$PM_{2.5}$	24-hour	0.0133	2
		Annual	0.0001	1
Popo Agie Wilderness Area	NO_2	Annual	0.0002	2.5
	SO_2	3-hour	0.0116	25
		24-hour	0.0015	5
		Annual	0.0001	2
	PM_{10}	24-hour	0.0381	8
		Annual	0.0006	4
	$PM_{2.5}$	24-hour	0.0114	2
		Annual	0.0002	1
Savage Run Wilderness Area	NO_2	Annual	0.0002	25
	SO_2	3-hour	0.0068	512
		24-hour	0.0009	91
		Annual	0.00001	20
	PM_{10}	24-hour	0.0336	30
		Annual	0.0007	17
	$PM_{2.5}$	24-hour	0.0274	9
		Annual	0.0004	4
Wind River Roadless Area	NO_2	Annual	0.00004	25
	SO_2	3-hour	0.0003	512
		24-hour	0.0001	91
		Annual	0.000002	20
	PM_{10}	24-hour	0.0125	30
		Annual	0.0003	17
	$PM_{2.5}$	24-hour	0.0072	9
		Annual	0.0001	4

AQRV Impacts

Visibility Impacts. Visibility impacts were calculated following the FLAG 2010 (FLAG, 2010) methodology and background data for the 20 percent cleanest days. The maximum impacts from either Construction or Operations with on-site processing are presented in Table 4.2-8 and indicate that there are zero days predicted above the 0.5 delta-deciviews (Δdv) threshold at any of the Class I and sensitive Class II areas. A maximum predicted visibility impact was 0.076 Δdv, occurring at Washakie Wilderness Area. The maximum impacts presented in Table 4.2-8, were the result of the Operations scenario.

Table 4.2-8
Maximum Visibility Impacts at Class I and Sensitive Class II Areas for Operations with On-Site Processing

Location	Maximum Impact (Δdv)
Bridger Wilderness Area	0.037
Fitzpatrick Wilderness Area	0.039
Mount Zirkel Wilderness Area	0.052
Washakie Wilderness Area	0.076
Popo Agie Wilderness Area	0.051
Savage Run Wilderness Area	0.052
Wind River Roadless Area	0.043

Deposition Impacts. Potential direct atmospheric deposition impacts within Class I and sensitive Class II areas were also calculated. At all Class I and sensitive Class II areas, the maximum direct total (wet and dry) N and S deposition are predicted to be well below the DAT of 0.005 kg/ha-yr. The maximum predicted N deposition impacts occurred at Savage Run Wilderness Area and are 0.0004 kg/ha-yr N and the maximum S deposition impacts occurred at Popo Agie and are 0.000006 kg/ha-yr. The maximum impacts are similar between the Construction and Operations scenarios.

In addition, estimated changes in acid neutralizing capacity - ANC (ΔANC) resulting from potential N and S deposition from Project emissions were calculated for ten sensitive lakes within the Bridger, Fitzpatrick, Mount Zirkel and Popo Agie wilderness areas. For all lakes, the estimated changes in ANC are all predicted to be less than the significance thresholds (10 percent ΔANC for lakes with background ANC values of 25 µeq/l or greater, and ΔANC<1 µeq/l for lakes with background ANC values less than or equal to 25 µeq/l). For the lakes with background ANC values above 25 µeq/l the estimated change in ANC was: 0.002 percent at Black Joe Lake, 0.002 percent at Deep Lake, 0.001 percent at Hobbs Lake, 0.002 percent at Ross Lake, 0.002 percent at Lake Elbert, 0.005 percent at Seven Lakes, 0.003 percent at Summit Lake, and 0.004 at Lower Saddlebag Lake. For the extremely sensitive lakes, the predicted change in ANC was 0.001 µeq/l at Lazy Boy Lake and 0.002 µeq/l at Upper Frozen Lake. The maximum impacts are similar for both the Construction and Operations scenarios.

Greenhouse Gas Emissions and Climate Change

The U.S. Supreme Court ruled in 2007 that the EPA has the authority to regulate greenhouse gases (GHGs) such as CH_4 and carbon dioxide CO_2 as air pollutants under the Clean Air Act; however, there are currently no ambient air quality standards for GHGs, nor are there currently any emissions limits on GHGs that would apply to sources developed under the Proposed Action and alternatives. There are, however, applicable reporting requirements under the EPA's Greenhouse Gas Reporting Program. These GHG emission reporting requirements, finalized in 2010 under 40 CFR Part 98, require industrial sources that emit 25,000 metric tons or more of CO_2e per year to report GHG emissions annually. The maximum Sheep Mountain Uranium

Project annual CO_{2e} emissions, from either the Construction or Operations phases, are 11,304 metric tons per year (Operations phase), which is less than the reporting threshold. At present, there are no rules related to GHG emissions or impacts that could affect development of the Proposed Action, besides these GHG reporting requirements.

The CEQ recently released draft guidance for federal agencies on consideration of GHGs and the effects of climate change in NEPA documents (CEQ, 2014). While the guidance provides federal agencies with significant discretion on how to consider the effects of GHG emissions and climate change in their evaluation of proposals for federal actions, it also provides an expectation of what should be considered and disclosed. Agencies are directed to consider two separate issues when addressing climate change: (1) the effects of a proposed action on climate change as indicated by its GHG emissions; and (2) the implications of climate change for the environmental effect of a proposed action. Agencies should consider the climate change effects of a proposal by comparing the GHG emissions of the proposed action and the reasonable alternatives. The effects of climate change on the proposed action and alternatives should be considered during the analysis of the affected environment. Land managers should consult the CEQ guidance for information on direct, indirect, and cumulative impact analyses, among other topics.

Renewable and nonrenewable resource management actions have the potential to impact climate change due to GHG emissions and other anthropogenic effects. However, the assessment of GHG emissions and climate change is extremely complex because of the inherent interrelationships among its sources, causation, mechanisms of action, and impacts. Emitted GHGs become well-mixed throughout the atmosphere and contribute to the global atmospheric burden of GHGs. Given the global and complex nature of climate change, it is not possible to attribute a particular climate impact in any given region to GHG emissions from a particular source. The uncertainty in applying results from Global Climate Models to the regional or local scale (a process known as downscaling) limits the ability to quantify potential future impacts from GHGs emissions at this scale. When further information on the impacts of local emissions to climate change is known, such information would be incorporated into the BLM's planning and NEPA documents as appropriate.

Sheep Mountain Uranium Project GHG emissions were not modeled in either the near-field or far-field impact analyses, but the total GHG inventory is presented here for informational purposes and is compared to other U.S. GHG emissions in order to provide context for the project GHG emissions.

The maximum annual GHG emissions resulting from the Proposed Action Operations scenario with on-site processing are estimated as 11,304 metric tons per year of CO_2e, which are approximately 0.01 teragrams per year (tg/yr). To place the Project GHG emissions in context, the Dave Johnston coal-fired power plant located east of Casper, Wyoming emits 5.1 tg/yr CO_2e (EPA, 2014a). In addition, 0.01 tg/yr is approximately equivalent to 0.0002 percent of total 2012 U.S. CO_2e emissions of 6,526 tg (EPA, 2014b).

4.2.1.1.2 Impacts with Off-Site Processing

Near-Field Modeling

The AERMOD model was used to estimate the maximum potential PM_{10}, $PM_{2.5}$, NO_x, CO, and SO_2 impacts for Operations with off-site processing. Table 4.2-9 presents the modeled air pollutant concentrations that could occur for this scenario. Construction impacts under this scenario would be identical to the impacts presented above for the Operations with on-site processing case.

Table 4.2-9
Maximum Modeled Pollutant Concentration Impacts
for Operations with Off-Site Processing (μg/m^3)

Pollutant	Averaging Period	Direct Modeled	PSD Class II Increment [1]	Background	Total Predicted	NAAQS	WAAQS
CO	1-hour	1,069.0[2]	--	904.0	1,973.0	40,000	40,000
	8-hour	185.5[2]	--	572.0	757.5	10,000	10,000
NO_2	1-hour	145.2[3]	--	9.4	154.6	188	188
	Annual	8.6[4]	25	1.9	10.5	100	100
SO_2	1-hour	9.3[5]	--	18.3	27.6	196	196
	3-hour	7.6[2]	512	18.3	25.9	1,300	1,300
	24-hour	3.1[2]	91	--	3.1	--	--
	Annual	0.03[2]	20	--	0.03	--	--
PM_{10}	24-hour	53.0[2]	30	49.0	102.0	150	150
	Annual	12.3[4]	17	11.0	23.3	--	50
$PM_{2.5}$	24-hour	12.1[2]	9	--	--	--	--
	Annual	1.3[2]	4	--	--	--	--
	24-hour	5.7[6]	--	27.0	32.7	35	35
	Annual	1.3[4]	--	7.0	8.3	12	15

[1] The PSD demonstration serves informational purposes only and do not constitute a regulatory PSD increment consumption analysis.
[2] Highest-second-high concentration.
[3] 2-year average of the 98th percentile daily maximum concentration.
[4] Maximum concentration.
[5] Maximum 99th percentile daily maximum concentration.
[6] Maximum 98th percentile concentration.

When the concentrations are added to representative background concentrations, it is demonstrated that total ambient air concentrations are less than the applicable NAAQS and WAAQS. The direct modeled concentrations are below all applicable PSD Class II increments except 24-hour PM_{10} and $PM_{2.5}$. The 24-hour PM_{10} and $PM_{2.5}$ impacts are controlled by fugitive sources like the mining pit and roads associated with Operations.

Potential ozone impacts resulting from this Project and other regional emissions have been predicted as part of the CD-C EIS (BLM, 2016b) and are discussed further in Chapter 5.

Far-Field Modeling

Far-field modeling at Class I and sensitive Class II areas within 200 km of the Project Area was performed using the CALPUFF model to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_x, SO_2, PM_{10} and $PM_{2.5}$ expected to result from Operations with off-site processing.

PSD Increment Comparison. The maximum direct modeled concentrations of NO_2, SO_2, PM_{10}, and $PM_{2.5}$ at Class I and sensitive Class II areas, resulting from either Construction or Operations, is provided in Table 4.2-10 for comparison to PSD Class I and Class II increments. As shown in Table 4.2-10, the maximum concentrations are well below the PSD Class I and Class II increments. The maximum impacts are associated with emissions from both Construction and Operations sources. The PSD demonstrations are for information only and are not regulatory PSD Increment consumption analyses, which would be completed as necessary by the WDEQ.

Table 4.2-10
Maximum Modeled Pollutant Concentrations at PSD Class I and Sensitive Class II Areas (μg/m³) for Operations with Off-Site Processing

Location	Pollutant	Averaging Time	Direct Modeled	PSD Increment
Bridger Wilderness Area	NO_2	Annual	0.0002	2.5
	SO_2	3-hour	0.0074	25
		24-hour	0.0009	5
		Annual	0.00001	2
	PM_{10}	24-hour	0.0219	8
		Annual	0.0004	4
	$PM_{2.5}$	24-hour	0.0078	2
		Annual	0.0001	1
Fitzpatrick Wilderness Area	NO_2	Annual	0.00001	2.5
	SO_2	3-hour	0.0002	25
		24-hour	0.00004	5
		Annual	0.000001	2
	PM_{10}	24-hour	0.0095	8
		Annual	0.0001	4
	$PM_{2.5}$	24-hour	0.0060	2
		Annual	0.0001	1
Mount Zirkel Wilderness Area	NO_2	Annual	0.0002	2.5
	SO_2	3-hour	0.0019	25
		24-hour	0.0002	5
		Annual	0.000004	2
	PM_{10}	24-hour	0.0129	8
		Annual	0.0005	4
	$PM_{2.5}$	24-hour	0.0083	2
		Annual	0.0002	1
Washakie Wilderness Area	NO_2	Annual	0.00001	2.5
	SO_2	3-hour	0.0001	25
		24-hour	0.0001	5
		Annual	0.000001	2
	PM_{10}	24-hour	0.0208	8
		Annual	0.0002	4
	$PM_{2.5}$	24-hour	0.0121	2
		Annual	0.0001	1
Popo Agie Wilderness Area	NO_2	Annual	0.0002	2.5
	SO_2	3-hour	0.0116	25
		24-hour	0.0015	5
		Annual	0.00001	2
	PM_{10}	24-hour	0.0364	8
		Annual	0.0005	4
	$PM_{2.5}$	24-hour	0.0085	2
		Annual	0.0002	1
Savage Run Wilderness Area	NO_2	Annual	0.0002	25
	SO_2	3-hour	0.0068	512
		24-hour	0.0009	91
		Annual	0.00001	20
	PM_{10}	24-hour	0.0304	30
		Annual	0.0006	17
	$PM_{2.5}$	24-hour	0.0267	9
		Annual	0.0003	4
Wind River Roadless Area	NO_2	Annual	0.00004	25
	SO_2	3-hour	0.0003	512
		24-hour	0.0001	91
		Annual	0.000002	20
	PM_{10}	24-hour	0.0103	30
		Annual	0.0003	17
	$PM_{2.5}$	24-hour	0.0066	9
		Annual	0.0001	4

AQRV Impacts

Visibility Impacts. Visibility impacts were calculated following the FLAG 2010 methodology and background data for the 20 percent cleanest days. The maximum impacts from either Construction or Operations with off-site processing are presented in Table 4.2-11 and indicate that there are zero days predicted above the 0.5 Δdv threshold at any of the Class I and sensitive Class II areas. A maximum predicted visibility impact was 0.071 Δdv, occurring at Washakie Wilderness Area. With the exception of the impacts at the Popo Agie Wilderness Area, the maximum impacts presented in Table 4.2-11, were the result of the emissions from construction.

Table 4.2-11
Maximum Visibility Impacts at Class I and Sensitive Class II Areas for Operations with Off-Site Processing

Location	Maximum Impact (Δdv)
Bridger Wilderness Area	0.032
Fitzpatrick Wilderness Area	0.036
Mount Zirkel Wilderness Area	0.049
Washakie Wilderness Area	0.071
Popo Agie Wilderness Area	0.032
Savage Run Wilderness Area	0.048
Wind River Roadless Area	0.030

Deposition Impacts. Potential direct atmospheric deposition impacts within Class I and sensitive Class II areas were also calculated. At all Class I and sensitive Class II areas, the maximum direct total (wet and dry) N and S deposition are predicted to be well below the DAT of 0.005 kg/ha-yr. The maximum predicted nitrogen deposition impacts occurred at Savage Run and are 0.0004 kg/ha-yr N and the maximum S deposition impacts occurred at Popo Agie 0.000006 kg/ha-yr. The maximum impacts are from Construction.

In addition, estimated changes in ANC resulting from potential N and S deposition from Project emissions were calculated for ten sensitive lakes within the Bridger, Fitzpatrick, Mount Zirkel and Popo Agie Wilderness Areas. For all lakes the estimated changes in ANC are all predicted to be less than the significance thresholds. For the lakes with background ANC values above 25 μeq/l the estimated change in ANC was; 0.002 percent at Black Joe Lake, 0.002 percent at Deep Lake, 0.001 percent at Hobbs Lake, 0.002 percent at Ross Lake, 0.002 percent at Lake Elbert, 0.005 percent at Seven Lakes, 0.003 percent at Summit Lake, and 0.004 at Lower Saddlebag Lake. For the extremely sensitive lakes, the predicted change in ANC was 0.001 μeq/l at Lazy Boy Lake, and 0.002 μeq/l at Upper Frozen Lake. The maximum impacts are from the Construction scenario.

Greenhouse Gases

The maximum annual GHG emissions from the off-site Operations scenario are estimated to be approximately 10 percent greater than the on-site Operations scenario. Potential impacts for off-site processing would be similar to the on-site processing case described above.

4.2.1.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.1.2 BLM Mitigation Alternative

4.2.1.2.1 Impacts

Impacts to air quality under the BLM Mitigation Alternative would be similar to those described above for the Proposed Action.

4.2.1.2.2 Monitoring and/or Compliance

Monitoring and Compliance under the BLM Mitigation Alternative would be the same as for the Proposed Action.

4.2.1.3 No Action Alternative

Under the No Action Alternative, Construction and Operations of the Project would not occur, and therefore, no impacts to air quality would occur from any of the action alternatives described above.

4.2.2 Geologic Resources

Potential issues associated with geologic resources were identified by the BLM through internal scoping. Issues include:

- Changes to physiography and topography of the area;
- Potential for changes to geologic structure; and
- Potential for geologic hazards including slope stability, subsidence, seismic hazards, and chemical hazards related to overburden and spoil quality.

4.2.2.1 Proposed Action

4.2.2.1.1 Impacts with On-Site Processing

Much of the Project Area was impacted by historic mining (Section 2.2.2). Therefore, this evaluation takes into account the extent of additional disturbance due to the Project as proposed and the extent to which the historic and new disturbance would be reclaimed during the Project as proposed. All of the identified impacts would be direct impacts.

Physiography and Topography

The existing physiography and topography of the Project Area, some of which was influenced by historic mining, would be modified by the proposed mining and ore processing facilities resulting in direct, long-term impacts. The physiography and topography would change in the Project Area during Construction and would continue to change through Operations as the mine expands, spoils piles grow, and the On-Site Ore Processing Facility expands. In all, about 929 acres of the 3,611 acres in the Project Area would be disturbed or re-disturbed. The most extensive surface features during Operations would be: the Congo Pit, which would cover about 216 acres and have highwalls up to 600 feet high; the Hanks Draw and South Spoil facilities, which would cover about 124 acres and be up to 300 feet high; and the On-Site Ore Processing Facility, which would cover about 205 acres, with a 40-acre Heap Leach Pad about 60 feet high, depending on the quantity of ore processed at the facility.

During Reclamation, the physiography and topography of the Project Area, with the exception of the Heap Leach Pad in the NRC License Area, would be reclaimed to approximate original contours where possible or geomorphically regraded to create stable topography within the Project Area that would be monitored until determined successfully reclaimed. The Heap Leach Pad would be reclaimed in accordance with NRC requirements to ensure stability during long-term care, and the proportions of the facility would be similar to those during Construction.

Backfill and regrading are two of the more expensive aspects of mine reclamation costs, and the requirement that the operator post a bond for site reclamation in accordance with an approved plan provides assurance that reclamation can be conducted by the permitting and licensing agencies should the operator not fulfill its obligations.

Geology

No impacts to the geologic structure are anticipated due to the Proposed Action. The stratigraphy of the Project Area has been impacted by previous mining, both on the surface and underground, due to the removal of sedimentary layers overlying the ore horizon and removal of ore, leaving open surface pits and underground voids. During Construction and Operations, the Proposed Action would have a similar direct impact as the historic activities, although many of the historic mining impacts were not reclaimed. During Reclamation of the Project, backfilling of the pit and underground mine would result in the homogenization of the backfill material, which would be unconsolidated compared to surrounding, undisturbed strata. Voids may remain in some areas underground.

Geologic Hazards

The geologic hazards include both physical and chemical hazards. The potential physical hazards include: slope stability (primarily a concern related to surface mining); subsidence (primarily a concern related to underground mining); and seismic hazards. The chemical hazards include impacts related to overburden and spoil quality.

Slope Stability. During Construction and Operations, potential physical hazards related to slope stability would be present at the Hanks Draw and South Spoil facilities and in the Congo Pit walls, which could slump if inadequately designed or drained. Results from direct shear testing of on-site materials were used for the designs of the Hanks Draw and South Spoil facilities, and the designs addressed factors such as vertical lift height, angles of repose, overall slopes, setbacks, and safety berms. Pit design was based on experience at other open pit mines in the Sheep Mountain and Gas Hills region and includes progressive backfilling. During Reclamation, the potential for slope failure would be removed because the spoil piles and pit would be backfilled and geomorphically regraded to create a stable topography within the Project Area that would be monitored until a regulatory determination that the area was successfully reclaimed.

Similar physical hazards would be present at the On-Site Ore Processing Facility, specifically the Heap Leach Pad, during Construction and Operations; however, through BLM monitoring/inspection activities these hazards would be minimized. Additionally, the rules and regulations promulgated by the NRC as well as the NRC License would likely minimize these hazards. During Reclamation, the focus of the license requirements would be on capping the facility to ensure stability during long-term care by the State of Wyoming or the DOE.

Subsidence. Potential physical hazards related to subsidence are present due to historic and proposed underground mining. Some subsidence has occurred due to historic underground mining (WDEQ, 2015a). Continued subsidence of those areas or new subsidence due to the proposed mining could occur, and procedures are in place to address encounters with known and potential subsidence areas that may occur during mining both the Congo Pit and the Sheep Underground Mine.

During Construction of the Congo Pit, ground control to locate and prevent accidental subsidence during surface mining is necessary. Ground control in the floor of the Congo Pit is discussed in Section 2.3.4.2. Similarly, prior to underground mining, rehabilitation of the existing underground workings is necessary. During rehabilitation (Construction) of the underground workings, rebolting of some areas may be necessary (Section 3.3 of the Plan of Operations). During Operations, mitigation of subsidence hazards includes ground control, progressive backfill, and collapse of underground workings during retreat mining (Section 4.2.1 of the Plan of Operations). During Reclamation, installation of bulkheads at specified depths would also mitigate long-term subsidence hazards (Section 5.2 of the Plan of Operations – Energy Fuels, 2015a).

Seismic Hazards. If an earthquake of sufficient magnitude were to occur, it could impact structural integrity of mine and associated facilities; however, given the relatively low probability of this magnitude of earthquake occurring within the Project Area, this is an unlikely scenario.

During Construction and Operations, seismic hazards could adversely affect slope stability at the Hanks Draw and South Spoil facilities and in the Congo Pit, as well as increase subsidence risks, if not taken into account in facility design. However, seismic loading conditions were taken into account in the design of the Hanks Draw Spoils Facility, and the NRC and WDEQ-LQD have stringent requirements that plans and procedures be in place to address accidental releases that could result from catastrophic events, such as an earthquake. During Reclamation, potential impacts of seismic hazards would be significantly reduced by the work to backfill and regrade site disturbances. Due to the nature of this Project and relatively low risk for earthquakes in this area (Section 3.2.2.3), the potential for Project activities (such as blasting) to induce an earthquake or seismic event is considered low.

Chemical Hazards. The primary concern related to chemical hazards is whether the overburden or spoil material contains material with deleterious properties, including elevated: acid-forming potential, Sodium Adsorption Ratio, levels of potentially toxic elements (e.g., boron) and/or radiological or metal concentrations. During Operations, elevated levels could require special handling (separate storage) of overburden or spoil materials to prevent contaminated drainage from spoil piles and to ensure such materials would be identified for proper placement during Reclamation. Direct adverse impacts to revegetation success and post-mine water quality could be anticipated if unsuitable overburden or spoil material were placed in the near-surface reclamation or below the water table and groundwater sampling would confirm the post-mine water quality (see Sections 4.2.4.1.1 and 4.2.5.4.1).

Based on sampling of the Quaternary Alluvial deposits and weathered Battle Spring Formation, no impacts from chemical hazards are anticipated (Section 3.2.2.3). Overburden sampling has been conducted, and material with elevated radiological concentrations represents the primary chemical hazard. This material is generally associated with the mineralized zones that would be removed during mining and transported to the Heap Leach Pad. Field measurements would be used to identify material for selective handling during Operations, so the material could be placed in the backfill with the least risk to revegetation success and post-mine water quality. In addition, the regraded spoil would be sampled prior to placement of topsoil to confirm the suitability of the material in and adjacent to the root zone, and groundwater sampling would confirm the post-mine water quality (Section 4.2.5.4.1).

The Heap Leach Pad and On-Site Ore Processing Facility would be designed to minimize any release of deleterious or toxic chemicals during Construction, Operation, and Reclamation as required through the NRC licensing process and BLM Performance Standards (43 CFR § 3809.429).

4.2.2.1.2 Impacts with Off-Site Processing

The impacts associated with off-site processing would be similar to those described above for on-site processing, and no new impacts to geologic resources (hazards) are anticipated to occur as a result of the Proposed Action at the off-site processing facility considering the facility is already constructed. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analyses as necessary.

4.2.2.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.2.2 BLM Mitigation Alternative

4.2.2.2.1 Impacts

The geologic impacts of the BLM Mitigation Alternative, which includes revisions to the Reclamation Plan, are not anticipated to differ significantly from those of the Proposed Action. If on-site processing occurs, approximately 90 acres of additional revegetation and road reclamation may occur on previously un-reclaimed or poorly reclaimed lands disturbed by historic mining activities in the Project Area. As a result of the additional revegetation and/or road reclamation, there could be minor differences in the post-mine physiography and topography, but the differences would not be substantial.

4.2.2.2.2 Monitoring and/or Compliance

Monitoring and Compliance under the BLM Mitigation Alternative would be the same as for the Proposed Action.

4.2.2.3 No Action Alternative

The No Action Alternative would not generate any additional impacts to the existing geologic resources except those already anticipated as a result of activities that would be conducted under Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and the WDEQ-AML Project 16-O (BLM, 2014b) for reclamation of McIntosh Pit.

4.2.3 Mineral Resources

Potential issues associated with mineral resources were identified by the BLM through internal scoping. Issues include:

- Temporary or permanent restriction of resource development; and
- Increased ease or difficulty of resource development, such as increased infrastructure or personnel needs.

4.2.3.1 Proposed Action

4.2.3.1.1 Impacts with On-Site Processing

It is anticipated that future development of mineral resources in the Project Area, other than uranium, would either be delayed for the duration of the Project or intermixed within the overall Project Area. However, as noted in Section 3.2.3, mineral resources are relatively limited in and near the Project Area, and there are no known proposals for development of mineral resources within the Project Area. Thus, the direct impacts of the Project to mineral resource development are negligible. If potential projects were to arise within the Project Area, it is expected that coexistence and conflicts would be negotiated and agreed upon between the different mineral rights owners, surface owners, and land management agencies. Impacts to mineral resources would be similar throughout the Construction, Operations, and Reclamation phases of the Project. Indirect impacts to mineral resource development near the Project Area such as existing and proposed oil and gas operations could occur through an increase in demand for fuel, equipment, labor, and other products and resources as a result of this Project. These indirect impacts could decrease productivity and increase costs of other mineral resource users which would impact the development of mineral resources; however, analysis of these impacts to other mineral users is inherently analyzed as an impact to various other resources such as socioeconomic resources and is described in detail in Section 4.4.4.

Locatable Minerals

No direct and indirect impacts to locatable mineral resources other than uranium are anticipated. As discussed in Section 2.3.5.13, Energy Fuels plans to continue uranium exploration within the Project Area. No other uranium exploration is currently on-going in the vicinity of the Project Area. In the Project Area, the currently known uranium resources would be mined. The subsequent reclamation and transfer of all or a portion of the 205-acre NRC License Area to the State of Wyoming or the DOE (Section 2.3.5.12 and Map 2.3-2) might make access to undiscovered or unexploited uranium deposits more difficult in the southwestern portion of the Project Area, but the existence of undiscovered resources is speculative, and unexploited uranium deposits in this area are either mined out, inaccessible, or accessible via underground mining without interference from the License Area.

Jade resources which may have occurred in the Project Area have probably been disturbed by prior mining-related activities. Access for jade prospecting during the Project would be restricted; however, after reclamation, access to the Project Area, except for the property transferred to the State of Wyoming or the DOE, would be reestablished.

The potential bentonite-bearing strata in the northern portion of the Project Area has never been prospected or explored. No known plans exist for the development of this potential, un-verified bentonite in the northern portion of the Project Area. Access for bentonite mining during the Project would be restricted; however, after reclamation, access to the Project Area except for the property transferred to the State of Wyoming or the DOE, would be returned.

Leasable Minerals

Existing oil and gas development is established outside the Project Area (Section 3.2.3.2), and the Project is not anticipated to impact that development directly. A previous exploration well in the Project Area is reported as dry and abandoned; and no exploration or development within the Project Area is anticipated in the foreseeable future.

Mineral Material Deposits

Mineral materials, such as sand and gravel, needed for the Project facilities would be generated during mining on-site, so these materials would be directly impacted through their removal and there are no anticipated impacts to off-site mineral material resources. The operator would need a permit to develop any mineral materials on BLM mineral lands where a reservation is held. Because the On-Site Ore Processing Facility would be regulated and permitted by the NRC and Energy Fuels has not submitted their NRC application, it is unknown whether additional off-site specialty materials (such as clay or limestone) would be needed for Construction or Reclamation of the On-Site Ore Processing Facility and impacts to off-site mineral materials cannot be speculated at this time. Appropriate permits would have to be acquired prior to extracting mineral material off-site from public lands which may or may not include additional NEPA analysis.

4.2.3.1.2 Impacts with Off-Site Processing

The impacts with off-site processing are not expected to differ from those with on-site processing because the infrastructure at the proposed off-site processing location and the transportation route to that location already exist. Impacts to locatable, leasable, and salable minerals are expected to be negligible as a result of processing uranium ore from the Project Area at the off-site facility. In addition, the scale of the Project as proposed would not substantially increase the need for mineral resources; additional sand and gravel may be needed for road maintenance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analyses as necessary.

4.2.3.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.3.2 BLM Mitigation Alternative

4.2.3.2.1 Impacts

The mineral resources impacts of the BLM Mitigation Alternative, which includes revisions to the Reclamation Plan, would be similar to those described above for the Proposed Action. If other areas outside of those identified for Reclamation under the Proposed Action are determined to be reclaimed as described in the BLM Mitigation Alternative, additional mineral materials may be required resulting in more direct impacts to mineral resources than identified in the Proposed Action.

4.2.3.2.2 Monitoring and/or Compliance

Monitoring and compliance under the BLM Mitigation Alternative would be similar to the Proposed Action.

4.2.3.3 No Action Alternative

Under the No Action Alternative, there would be no change in current mineral resource development and trends except those already anticipated as a result of activities that would be conducted under Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2016a) and the WDEQ-AML Project 16-O (BLM, 2014b) for reclamation of McIntosh Pit.

4.2.4 Soils

Potential issues associated with soils were identified through public scoping, BLM internal scoping, and public comment on the Draft EIS. Issues include:

- Potential effects to soil resources and soil productivity from the loss of topsoil through increased erosion; and
- Deleterious effects to soil chemical and physical characteristics from soil mixing, rutting, compaction, and potential spills.

4.2.4.1 Proposed Action

4.2.4.1.1 Impacts with On-Site Processing

Potential direct impacts to soils include physical removal, mixing or burying of surface soils, damage or destruction of soil properties in place, elimination or destruction of organic matter in soil stockpiles, spills and leaks onto soils, and the potential mixing of mineral soil, waste rock, and ore into the topsoil. Indirect impacts to soils could occur from wind and water erosion resulting in a loss of surface soils, thereby reducing soil and vegetation productivity.

Biological soil crusts (BSCs), if present, could also be impacted by the Proposed Action, including topsoil salvage. BSCs are composed of multiple organisms, including cyanobacteria, green algae, lichens, mosses, microfungi, and other bacteria (Belnap et al., 2001). Full recovery of BSCs from extensive disturbance is a slow process, particularly for mosses and lichens. Recovery of pre-disturbance crust thickness can take up to 50 years, and mosses and lichens can take up to 250 years to recover (BLM, 2012a). As noted in the vegetation survey (Appendix D-8 of the WDEQ-LQD Permit to Mine 381C – WDEQ, 2015a), cryptograms, including moss, lichen, algae, and fungi, were essentially absent within the proposed disturbance.

Available Topsoil and Coversoil

The Proposed Action would affect a total of 929 acres across five soil mapping units. Approximately 572.5 acres (62 percent) of the Proposed Action would be located within previously disturbed soils and 356.5 acres (38 percent) would be new disturbance.

Some of the 572.5 acres of previously disturbed areas have been or are being reclaimed. Soil productivity in reclaimed areas is expected to be less than the native undisturbed soils in the Project Area due to previous soil alterations that affect the physical and chemical properties of the soil through soil mixing, compaction, and loss of structure, organic matter, and nutrients.

Existing sources of suitable plant growth material for reclamation include in-place topsoil, in-place coversoil, and topsoil stockpiles from previous mining operations. Prior to surface disturbance, all available topsoil and coversoil would be salvaged and stockpiled. This would minimize the loss of topsoil and increase the likelihood of successful revegetation and reclamation. In addition, the use of coversoil would allow for reclamation of re-disturbed areas from which topsoil was not stripped prior to the original disturbance.

Salvage thicknesses of topsoil suitable as a plant growth medium ranged from less than 0.5 to 1.79 feet (see Table 3.2-9), exclusive of previously disturbed areas. According to the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a), approximately 580,000 cubic yards of topsoil would be salvaged during mining.

In addition to topsoil, Energy Fuels has identified up to 2,000,000 cubic yards of potential salvageable plant growth medium (coversoil) that would be salvaged and stockpiled, depending on accessibility and percentage of large rocks and boulders in the material. Coversoil thicknesses depths range from about 1.54 to 2.86 feet. In addition to the in-place topsoil and coversoil, approximately 220,000 cubic yards of topsoil salvaged during previous mining operations, is currently stockpiled within the Project Area. WDEQ-AML plans to use about 72,000 cubic yards of the stockpiled topsoil during reclamation of McIntosh Pit (WDEQ, 2015a), so the remaining 150,000 cubic yards would be used for reclamation related to the Proposed Action.

Salvage and Protection

During vegetation clearing and topsoil salvaging, all clearing work would be conducted when soils are not saturated. Topsoil and coversoil salvage would be directed by ground control personnel experienced with the identification of topsoil and/or other suitable plant growth material which may be encountered during excavation. Without vegetation, topsoil is vulnerable to erosion from storm events. Soil compaction could result in decreased infiltration rates and increased surface runoff, which can increase peak flows and further increase surface erosion. However, soil would be stripped from specific areas, such as roads, facilities, and the Congo Pit and stockpiled for replacement during Reclamation, reducing the potential for loss of topsoil.

Salvaged topsoil and coversoil would be placed in designated stockpile areas. Improperly protected stockpiles could also erode, resulting in loss of topsoil; however, topsoil and coversoil stockpiles would be stabilized by surface roughening, seeding, and mulching to minimize the loss of topsoil due to wind and water erosion over the life of the mine. An interim seed mixture approved by the WDEQ and the BLM would be used to establish a suitable vegetative cover on the piles for stabilization and to promote beneficial soil biological activity, aid in maintaining long-term soil productivity, and minimize weeds. The topsoil and coversoil piles would be clearly identified by signage in compliance with WDEQ regulations. These measures would also help to maintain the viability of soils with limiting characteristics. Temporary and permanent erosion controls would be installed as necessary to minimize erosion and capture sediment. In addition, a perimeter ditch/berm would be constructed around the stockpile for sediment control.

According to BKS (2014a), the hazard for wind and water erosion on the undisturbed soil mapping units within the survey area varies from negligible to moderate. However, the potential for wind and water erosion would increase with implementation of the Proposed Action due to the loss of vegetation cover, soil structure, and increased compaction compared to undisturbed soils. To minimize the potential for accelerated erosion and capture sediments, Energy Fuels would install and maintain temporary and permanent erosion controls, including silt fence, sediment control wattles, berms, ditches, culverts, and sediment ponds, as necessary, throughout the disturbed areas during Operations and Reclamation.

The spill contingency plans outlined in the Plan of Operations (Energy Fuels, 2015a) would minimize the potential for soil contamination during all phases of the Project. These measures include using designated fuel and lubricant storage areas that are appropriately contained by berms, and surrounding ore pads by berms constructed of compacted clay-amended soils. Mine shops and warehouses would be equipped with drain and waste containment sumps to contain spills. Spills of used oil, lubricants, and other liquid wastes from maintenance operations would be appropriately recycled and/or disposed off-site at a licensed facility.

Reclamation

Section 4.4.5 of the Reclamation Plan in WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) outlines reclamation practices that would minimize the loss of soil productivity and return disturbed areas to their pre-mining land use according to the reclamation success standards. These practices include regrading disturbed areas to their approximate pre-mine contours, redistributing topsoil and coversoil, and revegetating with native plant species approved by the BLM and WDEQ-LQD.

Subsequent to final grading, ripping would be completed prior to topsoil placement in areas of compacted substrate, including topsoil that has been compacted by haulage vehicles. Ripping would be done to a depth of 12 inches parallel to the contour at intervals sufficient to "shatter" compacted materials between rip lines.

Prior to topsoil placement, available topsoil would be inspected and/or sampled as necessary to determine the need for amendments to ensure fertility of the soil. Soil amendments might become necessary depending upon reclamation success. Examples of soil amendments consist of: grass hay, wood chips, or other weed free cellulosic materials, gypsum, elemental sulfur, and fertilizer.

After WDEQ-LQD approval of grading and sampling, topsoil would be placed in an incremental manner designed to limit haulage over previously placed topsoil. Replacement depths for suitable coversoil would be about 1 foot, with topsoil placement of at least 0.5 feet. With implementation of the reclamation practices outlined in the Permit to Mine 381C (WDEQ, 2015a), the final topsoil replacement depth is expected to be adequate to meet final reclamation success standards.

Revegetation would be completed as soon as appropriate after topsoil placement. Pitting and broadcast seeding is proposed for revegetating steeper areas, and contour ripping and drill seeding is proposed for less steep areas. Pitting creates a roughened micro surface that minimizes the development of rilling prior to the establishment of vegetation. In addition, the pits capture snow and enhance moisture availability.

4.2.4.1.2 Impacts with Off-Site Processing

The impacts associated with off-site processing would be similar to those described above for on-site processing. Soil impacts such as runoff from the road onto the adjacent topsoil, could be greater due to increased traffic on Crooks Gap/Wamsutter Road. However, the measures used to reduce road damage such as water bars and catchments (Section 4.4.6) would reduce the impacts. Additional impacts to soils at the Sweetwater Mill are not anticipated considering that the mill currently exists without requiring new disturbance. If any changes or updates to the existing permits became necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as required.

4.2.4.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.4.2 <u>BLM Mitigation Alternative</u>

4.2.4.2.1 Impacts

Direct and indirect impacts to soils under the BLM Mitigation Alternative would be similar to those described above for the Proposed Action, but would be reduced and reclamation success would be accelerated with implementation of a revised Reclamation Plan that would be required to comply with the BLM Wyoming Reclamation Policy (BLM, 2014d) and a Weed Management Plan. If on-site processing occurs, the Reclamation Plan revisions would also address previously unreclaimed lands, specifically about 90 acres of previously disturbed areas to offset BLM-managed land that would be permanently taken out of the public domain. Soil amendment plans would be submitted to the BLM for approval prior to the application of any soil amendment (S-1 in Table 2.4-1). With implementation of these measures, impacts to soils would be less under this alternative than under the Proposed Action.

4.2.4.2.2 Monitoring and/or Compliance

Monitoring and compliance under the BLM Mitigation Alternative would be the same as for the Proposed Action.

4.2.4.3 <u>No Action Alternative</u>

No additional direct or indirect impacts to soils described above for the Proposed Action and the BLM Mitigation Alternative would occur under the No Action Alternative. Activities that would be conducted under Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and the WDEQ-AML Project 16-O reclamation plans (BLM, 2014b) would be implemented to restore previously disturbed areas that have not been reclaimed which would utilize available stockpiled topsoil for reclamation and would require monitoring to achieve success standards defined in the WDEQ-LQD Permit to Mine 381C and the WDEQ-AML Project 16-O reclamation plans (see Chapter 5 for additional details).

4.2.5 Water (Surface, Groundwater, and Water Rights and Water Use)

For the impact evaluations, it has been assumed that in addition to the permits and licenses already acquired, Energy Fuels would acquire any additional necessary federal, state, and local permits/licenses and approvals for the Project, and the requirements of those permits would be met. It has also been assumed that Energy Fuels' applicant-committed measures, including those described in Chapter 2, and the agency-required measures and monitoring measures described in this section are fully and properly implemented.

4.2.5.1 Surface Water – Proposed Action Alternative

Potential issues associated with surface water were identified by the BLM through public scoping, internal scoping, and through public comment on the Draft EIS. Issues include:

- Alteration of stream channel geometry or gradient by accelerated runoff and erosion (e.g., undesirable aggradation, degradation, or side cutting) beyond what would be expected by natural processes;
- Alteration of streamflow characteristics of perennial streams such that established uses by the public and by federal, state, and local agencies for fisheries and wildlife and for livestock, recreational, municipal, and industrial uses are affected; and
- Degradation of water quality beyond the designated use of the receiving waterbody, or other violations of federal or state water quality standards, or negatively impacting a waterbody listed on the State 303d list of Impaired or Threatened Waterbodies.

4.2.5.1.1 Impacts with On-Site Processing

The existing surface water system that makes up the affected environment as described in Chapter 3 includes areas disturbed by historic mining; areas currently permitted by WDEQ-LQD (WDEQ, 2015a) for mining and reclamation in the Project Area; areas being reclaimed by WDEQ-AML (BLM, 2014b); and undisturbed areas part of which would remain undisturbed (Section 2.2.2.2 and Map 2.2-1). The Proposed Action would result in re-disturbance of some previously impacted areas as well as new disturbance within this surface water system.

The potential direct and indirect impacts to the surface water in and near the Project Area are identified first, along with associated protection measures. Surface water flow is then discussed, with an overview of general concerns followed by information on specific surface water features, such as Crooks Creek. Surface water quality is then discussed by the potential quality impact of concern, such as sediment transport. The existing surface water features of concern in and near the Project Area are described in more detail below and include:

- perennial streams (Crooks Creek and to a much lesser degree Sheep Creek);
- mine pit lake and impoundment (McIntosh Pit and Western Nuclear Pond); and
- ephemeral drainages which flow into either of the creeks, the pit lakes, or altered channels or closed depressions associated with subsidence or historic mine pits (e.g., the Paydirt Pit).

Applicant-committed measures to control sediment and limit erosion are described in Section 2.3.4.2 and listed in Table 2.4-1. Surface water monitoring is described in Section 2.3.12.3. Without the applicant-committed measures and monitoring to ensure the effectiveness of those measures, the disturbances and diversions could result in adverse direct impacts due to decreased streamflows, increased erosion potential from surface water runoff, and/or transport of sediment. Measures to protect surface water in and downgradient of the Project Area relate to protection of surface water flows and quality and to ensure the appropriate response if unanticipated conditions are encountered. In addition to applicant-committed measures, the NRC would require stringent plans and procedures to address surface water flows and quality in the NRC License Area, if the On-Site Ore Processing Facility were constructed.

Perennial Streams. For one of the perennial streams, Sheep Creek, the anticipated impacts to the quantity and quality of the water in the creek are indirect in that a small portion of the ephemeral drainages to this creek may be directly impacted, but not the actual creek. Indirect impacts to Sheep Creek could be anticipated due to the proposed activities which would affect the configuration of some of the ephemeral tributaries that flow into Sheep Creek.

For the other perennial stream, Crooks Creek, the anticipated impacts to the quantity and quality of the water in the creek are indirect, with one exception. Indirect impacts to Crooks Creek could be anticipated due to the proposed activities which would affect: the configuration of the ephemeral drainages that flow into Crooks Creek; the configuration of the existing mine pits and spoil piles, including reestablishment of through drainage where appropriate; and changes in groundwater exchange with surface flows. The one direct impact would be the discharge of treated water from the dewatering of the Congo Pit and the Sheep Underground Mine (Section 2.3.11).

McIntosh Pit and Western Nuclear Pond. As discussed in Section 2.5, the reclamation work on McIntosh Pit, including Energy Fuels' previous reclamation responsibility for the part of the pit, and related improvements to Western Nuclear Pond have been consolidated under the WDEQ-AML Project 16-O (BLM, 2014b). As a result, no direct impacts to either McIntosh Pit or Western Nuclear Pond are anticipated due to Project activities. The anticipated impacts to Western Nuclear Pond are also indirect or non-existent as part of the Proposed Action because no new disturbance is proposed within the drainage that feeds this pond.

If the On-Site Ore Processing Facility were built, there could be indirect impacts to McIntosh Pit due to the need to ensure the surface reclamation of the Facility was appropriately tied into reclamation of McIntosh Pit, specifically a smooth topographic transition and control of drainage from the Facility. Energy Fuels has considered this in the design of their facility, and these impacts would be minimized through the design. Additionally, Energy Fuels' reclamation of the On-Site Ore Processing Facility would be in compliance with applicable rules and regulations promulgated by the NRC and with the License.

Ephemeral Drainages. The anticipated impacts to the ephemeral drainages are primarily direct because of rerouting of drainages during the Project and during subsequent reclamation. The rerouting would change the flow patterns which could result in different areas of infiltration, erosion, and sedimentation than are currently present. In addition, one ephemeral drainage would receive the discharge of treated water from the dewatering of the Congo Pit and the Sheep Underground Mine (Section 2.3.11).

The proposed Construction and Operations activities that could impact surface water flow and quality include: road and facility construction; open pit mining; creation of mine spoil stockpiles; and mine dewatering. The road and facility construction disturbances generally involve relatively small areas, and surface water drainage can be addressed by local diversion of stormwater runoff and installation of culverts under some roads. The larger areas of surface disturbance, such as the Congo Pit, spoil facilities, and On-Site Ore Processing Facility require more extensive diversion of stormwater, including rerouting of drainages and filling of drainages. The mine dewatering could reduce groundwater discharge to Crooks Creek; however, the mine dewatering and subsequent discharge of the treated water to an ephemeral drainage would increase direct surface water flow to Crooks Creek.

<u>Surface Water Flow</u>

The potentially adverse disruption of surface water flows which would occur during Construction and Operations would be eliminated during Reclamation.

Because of the extent of the Project surface disturbance in the proposed surface mining areas, such as the Congo Pit and spoils facilities (Section 2.3), the most extensive direct impact would be diversion of stormwater, including rerouting of drainages and filling of drainages. During

Construction and Operations, design of diversion channels and sediment ponds to handle anticipated surface water flows is essential to ensuring the flows are diverted and contained as necessary. Design considerations are summarized in Section 2.3.4.2.

The sediment ponds are designed to capture runoff from the disturbed areas, such as the spoils, to prevent sediment dispersal into drainages or onto topsoil; and from the undisturbed area, to prevent surface water flow into the pit. The sediment ponds would be sized to contain the 100-year, 24-hour storm plus ensure that the estimated sediment storage volume for one year is always available. Therefore, the sediment ponds are not intended to allow release of any water; however, the emergency sediment pond spillways would pass a minimum of the 25-year storm, in accordance with WDEQ regulations (Section C-31(c) of the WDEQ Water Quality Rules and Regulations (WDEQ, 1984)). The WDEQ regulations only require sediment ponds to impound the 10-year, 24-hour storm (WDEQ, 1984), and the intent is to impound water long enough for the sediment to settle prior to discharge. However, due to concerns about the potential for radium in the discharge water, the sediment ponds in the Project Area were sized to substantially reduce the possibility of discharge. The sediment ponds designed under the Proposed Action would not discharge water and would only release water through loss by evaporation and infiltration.

It is recognized that the use of design storm events may not cover all the storm events encountered during the life of a project, particularly given the variability of precipitation and snow melt in high desert environments. The WDEQ-LQD statutes and regulations provide for measures to address the possibility of unexpected events, including: inspections to ensure the surface water control features were properly constructed and are functioning (e.g., Sections VI and VII of WDEQ-LQD Guideline 15); annual reports with evaluation of the extent to which "expectations and predictions" have been met (Wyoming Statute § 35-11-411); and designation of operator duties, including protection of soil and water (Wyoming Statute § 35-11-415). Because the sediment ponds are constructed to not allow overflow and meet/or exceed WDEQ statutes and regulations that instruct management of surface water within the Project Area, the impacts associated with re-routing of drainages around the Congo Pit and water management on site are due and necessary.

Other hydrologic mitigation features would consist of culverts with inlet and outlet protection installed during the road development and erosion control features such as the sediment control fence (Section 2.3.3.3).

During Reclamation, all of the drainage reestablishment would be based on geomorphic principles to enhance long-term stability and create a diverse and erosionally-stable landscape (Section 2.3.12.4). It may be necessary to armor drainage channels which cross areas of backfill to prevent infiltration of the drainage so the channel does not flow as planned.

During Construction and Operations, the underground mining could potentially cause subsidence of subsurface geologic layers, which could extend to the surface and disrupt drainage patterns. As discussed in Section 2.3.4.3, spoils from the mine would be replaced within the mined out workings where possible, and as mining progresses, collapse would only be allowed in areas without mineralization in the overlying rock. Limiting the extent of collapse would reduce the potential for subsidence. In addition, as discussed in Section 2.3.5.4, bulkheads would also be installed during Reclamation, which would further minimize the potential for mine subsidence to reach the surface.

If the ore were processed on-site, the NRC License Area would encompass the On-Site Ore Processing Facility in the southern portion of the site (Section 2.3.3.7 and Map 2.3-2). Much of this area was disturbed during historic mining. NRC reviews both technical and environmental aspects of the Proposed Action, including concerns related to radiation safety, as well as drainage designs within the NRC License Area. However, based on the design of the On-site Ore Processing Facility presented in the Plan of Operations, the impacts to surface water flow would be minimal because the facility is designed to not allow any off-site discharge. Furthermore, by designing and controlling the surface water flow in and around the NRC License Area, erosion of existing spoils and sedimentation down-slope at this location would likely decrease. At least a portion of this area, though perhaps not all, would be turned over to the State of Wyoming or the DOE for long-term care (Section 2.3.5.12). The NRC reviews reclamation plans and as-built topography for stability, including the ability to resist stormwater flows resulting from a PMP event (NRC, 2002). Such an area would include both the surface and subsurface, and existing property rights, such as water rights, and mineral resource development opportunities, such as oil and gas leases, and would be addressed at time of transfer.

Sheep Creek Drainage. Sheep Creek receives surface water runoff from several ephemeral drainages and the upper reaches of five of these drainages are partially within the Project Area (subbasins SC1 through SC5 shown on Map 3.2-10). These five drainages comprise less than 20 percent of the Sheep Creek drainage. There are existing and planned Project activities in the upper reaches of three of those drainages, such as placement of a topsoil stockpile at the upper end of the Congo Pit and the Sheep I Shaft (see Map 2.3-1). However, during Project Construction and Operations, any surface water flows near those activities would be diverted to sediment ponds within the Project Area. Therefore, no runoff from the Proposed Action would contribute directly to Sheep Creek or the ephemeral drainages tributary to it. During Reclamation, which would take about 10 more years, the diversions and sediment ponds would be removed and through-drainage reestablished. Because the existing and proposed disturbance areas comprise less than 5 percent of the Sheep Creek drainage, the diversion of water from these areas is not anticipated to cause adverse or beneficial direct or indirect impacts to Sheep Creek flows during the life of the Project.

Crooks Creek Drainage. The potential indirect and direct impacts to the surface water flows in the Crooks Creek Drainage could result from two different actions: ephemeral drainage diversion and subsequent reestablishment; and dewatering. The potential indirect impacts relate to diversion of ephemeral drainages during Construction and Operations and subsequent reestablishment of the drainages during Reclamation. Another potential indirect impact would be changes in the exchange of groundwater and surface water during mine dewatering. A direct impact would be increased flow in one of the ephemeral drainages during Operations when discharge of treated water from the surface and underground mine dewatering is necessary. As discussed below, the net, long-term impact to the surface water hydrology from the Proposed Action is essentially slight alterations of runoff patterns in the ephemeral drainages. The final reclamation contours are illustrated on Map 4-1 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

Ephemeral Drainage Diversion and Subsequent Reestablishment. Crooks Creek drains approximately 90 square miles above the Project's furthest downstream surface water sampling location on Crooks Creek (XSCCDS on Map 3.2-10).

Crooks Creek receives occasional surface water runoff from ephemeral drainages which flow through the Project Area. Historically, there were more drainages which flowed through the Project Area to Crooks Creek; however, as a result of previous mining-related activities, through flow was blocked in some drainages (e.g., the drainage which currently ends at impoundment SW-1). The ephemeral drainages which cross the Project Area to Crooks Creek, including those which have been blocked, comprise only about 10 percent of the Crooks Creek Drainage. Map 3.2-10 shows the extent of the Crooks Creek Drainage, and Map 3.2-11 shows the locations of the ephemeral drainage subbasins within the Project Area.

Subbasins CC1 through CC9 and SM1 through SM3 cover an area of approximately 9 square miles or 10 percent of the Crooks Creek Drainage. Within these subbasins in the Project Area, the watershed contributing flows to the drainages would be reduced by about 20 percent during Construction and Operations, which would take place over about 11 years. Surface water flows in some of these subbasins would be diverted to sediment ponds within the Project Area; therefore, no runoff from the Proposed Action would contribute directly to Crooks Creek without sediment control to reduce the potential for adverse indirect impacts to surface water flow in Crooks Creek. During Reclamation, the diversions and ponds would be removed and the ephemeral channels reestablished, including several which were previously blocked. All of the drainage reestablishment would be based on geomorphic principles to enhance long-term stability and create a diverse and erosionally-stable landscape (Section 2.3.12.4), eliminating any adverse impacts that may have occurred during Construction and Operations and improving drainage characteristics and flow to Crooks Creek in those drainages that are currently blocked.

Dewatering. The groundwater impacts related to dewatering of the Congo Pit and Sheep Underground mine are discussed in Section 4.2.5.4. The potential indirect and direct impacts to surface water related to dewatering are discussed in this section. Water discharged from the dewatering system could be entirely consumed on-site if the On-Site Ore Processing Facility were constructed. The water would be piped to the Facility and introduced into the leaching cycle in which it would be recycled in the Heap Leach, used in the Extraction Plant, lost to evaporation, or disposed of as part of the liquid waste (Section 2.3.3.7). The quantity of water needed for processing could vary over time; therefore, discharge of the some of the water from the dewatering system could be necessary.

Potential dewatering impacts to the surface water system could result from changes to the exchange of surface water and groundwater; and the amount of surface water flowing from the site to Crooks Creek. As discussed in Section 3.2.5.1, the exchange of surface water and groundwater along that portion of Crooks Creek adjacent to the site is limited. Therefore, no adverse impact to the surface water flows, e.g., diminution of the groundwater contribution to Crooks Creek or increased seepage from Crooks Creek, is anticipated if all the water from the dewatering system were consumed on-site. Because the maximum dewatering discharge, i.e., the most surface water flowing from the site to Crooks Creek, would occur if the ore were processed off-site, the impacts of the dewatering discharge are discussed in Section 4.2.5.1.2 (Impacts with Off-Site Processing).

Surface Water Quality

Potential impacts to the surface water quality in the ephemeral drainages and existing pit lakes in the Project Area relate to increased sediment transport, to spills and leaks, and to dewatering discharge.

Sediment Transport. The potential adverse water quality impacts from sediment transport include degradation due to increases in suspended solid concentrations in runoff from disturbed lands and increased sedimentation in surface water features resulting from construction on adjacent upland areas. Road and facility construction reduce vegetation cover and compact soils from heavy machinery and frequent traffic. Without vegetation, topsoil is vulnerable to erosion from storm events. Soil compaction could result in decreased infiltration rates and increased surface runoff, which can increase peak flows and further increase surface erosion. However, soil would be stripped from specific areas, such as roads, facilities, and the Congo Pit and stockpiled for replacement during Reclamation, reducing the potential for adverse impacts from sediment transport. Improperly protected stockpiles could also erode, increasing sediment loads in surface water runoff; however, measures such as seeding and inspection would ensure that erosion from the stockpiles does not contribute to sediment transport, reducing the potential for adverse impacts. During Operations, improper storage of ore and spoils could result in increased sediment transport, which could be contaminated due to potential mobilization of metals from the ore and spoils due to oxidation of the material. During Reclamation, activities such as discing to loosen compacted soil could result in increased sedimentation to surface water runoff if erosion increased.

Energy Fuels would implement the following measures to address surface water quality impacts related to sediment transport:

- limit soil compaction and removal and protect excavated topsoil and subsurface material from erosion in accordance with Standard Operating Procedures (SOPs) and the SWPPP.
- ensure that runoff from disturbed areas meets WYPDES permit guidelines for stormwater management and sediment reduction.
- complete appropriate reclamation practices in a timely manner. After short-term disturbances during Construction, such as pipeline installation, the disturbed areas would be revegetated with either a temporary seed mix (Table 4-5 of the WDEQ-LQD Permit to Mine 381C – WDEQ, 2015a) or with the permanent seed mix (Tables 2.3-5 and 2.3-6 in Chapter 2).
- Comply with the 43 CFR § 3809.420 Performance Standards, any requirements of WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a), and any requirements developed through the NRC licensing process.

Sediment transport impacts related to the dewatering discharge are discussed below.

During Project Construction and Operations, which would take place over about 11 years, surface water flows in some of the ephemeral drainages which flow through the Project Area would be diverted to sediment ponds, within the Project Area, which were conservatively designed as discussed under Surface Water Flow. Therefore, no runoff from the Proposed Action would contribute directly to Crooks Creek without sediment control to reduce the potential for adverse indirect impacts to surface water flow quality in Crooks Creek. During Reclamation, which would take about 10 more years, the diversions and ponds would be removed and the ephemeral channels reestablished, including several which were previously blocked. All of the drainage reestablishment would be based on geomorphic principles to enhance long-term stability and create a diverse and erosionally-stable landscape (Section 2.3.12.4).

Spills and Leaks. Surface water runoff to the ephemeral drainages and pit lakes in the Project Area could be impacted due to a spill or leak from machinery, pipelines, or tanks in use during Construction, Operations, or Reclamation. In addition to the use of measures to comply with SOPs, the SWPPP, and WYPDES requirements, the environmental protection measures to prevent and mitigate spills and leaks include selection of appropriate materials for pipelines and tanks, proper installation and testing of those materials prior to use; and inspection and maintenance. Piping and associated fittings would only be constructed of materials that are chemically compatible, able to withstand the expected operating pressures, and compatible with ambient conditions. Pipelines would be checked before being placed into operation and after significant repairs. Berms would be in place in and around the Plant to control the movement of spills. Storage tanks for fuels and other liquids would comply with Chapter 17 of WDEQ-WQD's rules and regulations on storage tanks (WDEQ, 2012b). Inspections would be regularly scheduled. Should a spill or leak occur, remediation and reporting procedures would be conducted in accordance with the spill contingency plans described in Section 2.3.10.

If the ore were processed on-site, the NRC License would include requirements for control of runoff from the entire processing facility including the Heap Leach Pad during a PMP significant precipitation event as defined by the NRC. Overflow drainage channels, with double-lined leak detection systems, would be constructed around the Collection Pond and Raffinate Pond to direct any overflow to the Holding Pond (Section 2.3.3.7.2). Based on the design of the ore processing facility presented in the Plan of Operations, the impacts to surface water quality would be minimal because the Facility is designed to not allow any surface water discharge. Both the NRC and the DOE review the reclamation plans and as-built topography for stability, including the ability to resist stormwater flows resulting from a PMP event (NRC, 2014). Should a spill or leak occur, remediation and reporting procedures would be conducted in accordance with the applicable rules and regulations promulgated by the NRC or required by the License.

As discussed in Section 3.2.5.1, a portion of Crooks Creek has a WDEQ-WQD 303d listing (Category 5 impaired stream) for oil and grease contamination in the SWNE ¼ of Section 18 T28N R92W (WDEQ, 2012a). However, the condition appears to be temporary or aberrant, e.g., the result of a spill, based on subsequent water quality sampling, although additional sampling is required (Hyatt, 2014). No direct or indirect adverse impacts to Crooks Creek are anticipated from any on-site spills and leaks.

Dewatering Discharge. Water discharged from the dewatering system could be entirely consumed on-site if the On-Site Ore Processing Facility were constructed. The water would be piped to the Facility and introduced into the leaching cycle in which it would be recycled in the Heap Leach, used in the Extraction Plant, lost to evaporation, or disposed of as part of the liquid waste (Section 2.3.3.7). However, the quantity of water needed for processing could vary over time, therefore, discharge of some of the water from the dewatering system could be necessary. Because the maximum dewatering discharge would occur if the ore were processed off-site, the impacts of the dewatering discharge are discussed in the next section.

As noted in Section 2.3.3.4 (Utilities), non-potable water for ore processing, dust suppression on the site roads, fire suppression systems, and washing equipment would be supplied by dewatering of the Congo Pit and Sheep shafts. Use of this untreated water would be limited to areas where drainage is controlled (in and around the Congo Pit) to avoid the potential for off-site drainage. The site stormwater controls including use of untreated water for dust suppression have been approved by the WDEQ through various permits such as the WDEQ-LQD Mine Permit 381C, WYPDES, and SWPPP; therefore, the impacts associated with using untreated water for dust suppression and water management on site are due and necessary.

4.2.5.1.2 Impacts with Off-Site Processing

The impacts associated with off-site processing would generally be similar to those described above for on-site processing, with the exception of impacts associated with dewatering discharge, which could be more extensive as discussed in the section below. The magnitude of adverse impacts caused by erosion could be increased due to the increased traffic on Crooks Gap/Wamsutter Road and Minerals Exploration Road; however, the measures used to reduce road damage, water bars and catchments (Section 4.4.6) would mitigate the increased impact. Any additional impact to surface water at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new surface disturbance. If any change or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

Dewatering Discharge. Energy Fuels anticipates that, during the first year of mining, the dewatering rate is anticipated to exceed the consumption rate, based on the site-wide water balance (WDEQ, 2015a). The amount of excess water would depend on whether or not the On-Site Ore Processing Facility is constructed. Energy Fuels has an approved WDEQ-WQD

WYPDES Permit (WY0095702) for the treatment and discharge of mine water in accordance with the provisions of the WYPDES program (WDEQ, 2015b). Treatment of the mine water for removal of radium is necessary, and treatment for removal of uranium or other parameters may be necessary in compliance with the approved WYPDES Permit (WDEQ, 2015b). Water from the dewatering system would be stored in a lined pond on the Ore Pad, and the treatment system would also be located on the Ore Pad. The pretreatment temporary storage and settling ponds are lined, no additional surface disturbance is necessary, and runoff from the Ore Pad would be controlled; therefore, no impacts to surface water are anticipated from the water treatment facility. See Section 2.3.11 (Water Management Plans) for more details.

Surface Water Flow. The treated water would be discharged to an ephemeral drainage on the northwest side of the Ore Pad. This drainage was constructed by WDEQ-AML as part of their reclamation of the Paydirt Pit several years ago. Energy Fuels would install riprap at the discharge location to prevent erosion at the outfall. Similar discharge permitted by WDEQ-LQD and WDEQ-WQD occurred during the 1970s and 1980s through Hanks Draw and no adverse impacts to Crooks Creek were reported or were evident. Based on the calculated extent of groundwater drawdown during Operations (Appendix D-6 of the WDEQ-LQD Permit to Mine 381C – WDEQ, 2015a), the dewatering of the Congo Pit would not indirectly impact surface water and groundwater exchange which may be occurring along Crooks Creek. The more extensive drawdown during the dewatering of the Sheep Underground Mine could impact surface water and groundwater exchange along Crooks Creek by possibly reducing groundwater contribution to the creek and possibly inducing recharge from the creek. During Operations, any adverse impact to the exchange of surface water and groundwater, e.g., diminution of the groundwater discharge to surface water, would be offset by discharge of the treated water from dewatering of the Congo Pit and the Sheep Underground Mine (Section 2.3.11). During Reclamation, any impact to the surface and groundwater exchange would be eliminated by the recovery of the groundwater levels. Based on historical data, the previous dewatering of the Congo Pit and Sheep Underground Mine did not adversely impact the flow in Crooks Creek. During dewatering of the Congo Pit in the mid-1970s, the treated water was discharged to Hanks Draw (National Pollutant Discharge Elimination System - NPDES Permit 0024490). However, during dewatering of the Sheep Underground Mine for a 10-year period at rates on the order of 200 to 250 gpm, the water was discharged to McIntosh Pit rather than the creek. Even so, as noted above, no adverse impact to the creek flow was reported or evident.

The direct impact of the dewatering discharge to an ephemeral drainage during Operations would be beneficial because of the importance of water in this climate; however, the benefit would be temporary because during Reclamation, the discharge would cease. Ephemeral drainages in this semi-arid climate pass elevated flow rates during snowmelt and after thunderstorms. The ephemeral drainage to which the water from the Project would be discharged was constructed by WDEQ-AML during reclamation of the Paydirt Pit several years ago, and consists of rip-rap sediment control structures every 100 feet. The outfall would be less than 1 mile from Crooks Creek. Based on the characteristics of this drainage (Lidstone, 2013), substantial changes to the channel for erosion protection are not anticipated to be necessary. However, energy-absorbing rip rap would be used at the outfall to help prevent erosion of the drainage. Further, the authority on water discharge in Wyoming is the WDEQ-WQD under the WYPDES program. Energy Fuels' WYPDES Permit clearly states as measure A.1 of Part 1 under Permit WY0095702 that "all waters shall be discharged in a manner to prevent erosion scouring, or damage to stream banks, stream beds, ditches, or other waters of the state at the point of discharge."

With respect to Crooks Creek, the dewatering discharge would not contribute more water to the creek than it generally carries, although there would be fewer low flows in the creek. This assessment assumes all of the dewatering discharge reaches the creek from the ephemeral drainage. This assumption is highly unlikely considering the discharge would flow to a drainage designed to minimize erosion by slowing water and decreases in gradient significantly where the drainage spreads out into two shallowly sloping drainages in sand before reaching Crooks Creek. The lowest and highest recorded flows in the creek adjacent to the Project were 2.3 cfs and 7.6 cfs, respectively (Table 1 in Appendix 3-B), which converts to about 1,000 to 3,400 gpm. Based on the flow measurements on the West Fork of Crooks Creek (Table 2 in Appendix 3-B), higher flows could be anticipated in Crooks Creek. The anticipated range of discharge flow rates during most of the Project is 0.6 to 0.9 cfs (250 to 400 gpm). If all the discharge flowed to the creek, the anticipated range of the discharge rates would increase the low flow rate in the creek by 25 to 40 percent of the lowest recorded creek flow rate. However, that increased rate would be less than the highest recorded flow adjacent to the Project. If the highest discharge rate occurred simultaneously with the highest recorded flows adjacent to the Project, the increase would equal 10.6 cfs, or an increase of approximately 40 percent. The highest anticipated discharge rate of about 3 cfs (1,375 gpm), which could occur for 9 months to 1 year, would more than double the lowest recorded flow rate in the creek, however, the increased flow rate (5.3 cfs) would be less than the highest recorded flow (7.6 cfs) adjacent to the Project. At the average flow rate measured downstream of the Project (4.8 cfs), the increase from the dewatering discharge would result in a flow rate near the highest recorded flow. Based on the measurement of significantly higher flows in the West Fork of Crooks Creek (Table 2 in Appendix 3-B), the combination of the discharge rate and highest recorded flow adjacent to the Project is not anticipated to exceed historic flow rates in Crooks Creek (255 cfs in 1975, 46 cfs average historic flow rates), nor do these changes in flow rates represent large quantities of water even for the Crooks Creek drainage with the highest anticipated possible flow of 10.6 cfs (from 7.6) as a result of discharge for up to 1 year or average flow of 5.3 cfs (from 4.8) for up to 8 years. These flows are certainly not sufficient to change the characteristics of Crooks Creek to the point that water would reach the Sweetwater River. Therefore, substantial changes and adverse impacts to the flow in Crooks Creek, or to its extent across the Sweetwater River Valley, are not anticipated.

Surface Water Quality. In October 2015, WDEQ-WQD approved a permit for discharge of treated mine water to the surface under the WYPDES Program (WDEQ, 2015b). Treatment of the mine water for removal of radium is necessary, and treatment for removal of uranium or other parameters may be necessary in the future. The treatment method(s) required under the provisions of the WYPDES Permit specify the parameter(s) of concern for discharge to Crooks Creek, and the BLM must assume that the conditions of the WYPDES Permit are adhered to; therefore, no adverse impacts to overall water quality are anticipated. The discharge limitations per the approved WYPDES Permit WY0095702 are characterized below in Table 4.2-5. Effluent limits consider federal and state regulations and standards and incorporates the most stringent requirements. See Section 2.3.12.3 and Appendix 2B for more information on effluent limits. If determined necessary to meet limits during operations, a processing step for uranium removal would be added to the treatment system (e.g., ion exchange, IX, treatment). See the permit (WY0095702) for more information.

Table 4.2-5
WYPDES Permit WY0095702 Effluent Limitations

Effluent Characteristic	Discharge limitations	
	Monthly Average	**Daily Maximum**
Chemical Oxygen Demand, ,mg/l	100	200
Dissolved Radium 226, pCi/l	3	10
Oil and Grease, mg/l	N/a	10
Total Radium 226+228, pCi/l	N/A	5
Total Recoverable Selenium, µg/l	N/A	1
Total Suspended Solids, mg/l	20	30
Total Uranium (as U), mg/l	2.0	4.0
Total Zinc, mg/l	0.5	1.0
Dissolved Zinc, µg/l	N/A	23
pH	N/A	6.5-9.0

4.2.5.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.5.2 Surface Water – BLM Mitigation Alternative

4.2.5.2.1 Impacts

The direct and indirect water resources impacts of the BLM Mitigation Alternative, which includes revisions to the Reclamation Plan, would not be anticipated to differ noticeably from those of the Proposed Action. If on-site processing occurs, the Reclamation Plan revisions would address previously unreclaimed lands, specifically about 90 acres of previously disturbed areas to offset BLM-managed land that would be permanently taken out of the public domain. The reclamation might provide for more stable soils and, as a result, less potential for erosion and sedimentation which could benefit surface water quality.

4.2.5.2.2 Monitoring and/or Compliance

Monitoring and Compliance under the BLM Mitigation Alternative would be the same as for the Proposed Action.

4.2.5.3 Surface Water – No Action Alternative

The No Action Alternative would not generate any additional direct or indirect impacts to the existing surface water resources or change any of the existing uses except those already anticipated as a result of Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and the WDEQ-AML Project 16-O reclamation plans (BLM, 2014b) for reclamation of McIntosh Pit. For those areas for which Energy Fuels does not have reclamation responsibility, the WDEQ-AML Project 16-O plans address the existing disturbance which poses the greatest safety concern, which is currently McIntosh Pit (Chapter 5). The plans would reduce the potential for erosion, through regrading and revegetation, and would re-establish some through-drainages.

4.2.5.4 <u>Groundwater – Proposed Action Alternative</u>

Potential issues associated with groundwater were identified by the BLM through public scoping, internal scoping, and through public comment on the Draft EIS. Issues include:

- Interruption or reduction of the natural flow or level of groundwater to existing local springs, seeps, wells, or permitted water supply wells to the point that existing hydrologic function and beneficial uses cannot be maintained; and
- Degradation of groundwater quality in any aquifer such that it would conflict with any applicable rules or regulations such as the WDEQ-WQD criteria for evaluating potential water uses based on water quality (WDEQ-WQD Rules, Chapter 8, Table I – WDEQ, 2015d) which would result in unnecessary or undue degradation of public lands.

4.2.5.4.1 Impacts with On-Site Processing

The existing groundwater system that could be affected by the Proposed Action includes portions of the undifferentiated Battle Spring and Fort Union formations (referred to as the Project Area Aquifer). As discussed in Section 3.2.5.2, the Battle Spring and Fort Union formations are the water-bearing formations in the vicinity of the Project Area. Because of the heterogeneity of the geologic materials in these formations, the formations are difficult to distinguish and the term Project Area Aquifer is used to collectively refer to the water-bearing strata in the Battle Spring and Fort Union formations. There is also variability in the hydrogeologic properties within the formations due to lithologic variations, e.g., lenses and layers of material rather than homogenous material. The synclinal structure of the Cody Shale aquitard provides a significant control on the movement of water out of these formations. The system also includes shallow groundwater in alluvial deposits along Crooks Creek to the west of the Project Area.

In the Project Area, the groundwater system in the Project Area Aquifer was affected by historic underground mining and currently permitted activities in the Project Area (Section 2.2.2 and Map 2.2-1). The hydrologic data collected during historic mining, including surface and underground mine dewatering, offers unique insight into the drawdown resulting from pumping for mine dewatering and subsequent recovery after pumping ceases. The historic information has been supplemented with more recent information, including data from installation, testing, and sampling of new wells and results from groundwater modeling.

The Proposed Action would result in additional changes in the subsurface conditions that could directly impact groundwater quantity, flow, and quality. The impacts to groundwater quantity and flow are discussed first, followed by discussion of the impacts to groundwater quality.

<u>Groundwater Quantity and Flow</u>

Impacts to the groundwater quantity and flow in and near the Project Area are described in more detail below and could result from:

- groundwater withdrawals for Project water supply;
- groundwater withdrawals to dewater the Congo Pit and the Sheep Underground Mine;
- backfilling of the Congo Pit and the Sheep Underground Mine; and
- increased interconnection within the aquifer due to tunnels and subsidence.

<u>Project Water Supply</u>. It is anticipated that all non-potable water supply needs can be generated from water produced during dewatering that would be treated on-site with barium chloride to reduce radium concentrations as necessary.

As discussed in Sections 2.3.3.4 and 2.3.11.3, potable water would be obtained from the Jeffrey City Water and Sewer District via water trucks. This water consumption would equal approximately 2,000 gpd, which is within the current capacity of the District system. If necessary when the Project is fully operational and if the On-Site Ore Processing Facility were built, the on-site treatment system could be upgraded to produce potable water.

Congo Pit. Based on the depth of the phreatic surface and the mining rate, the Congo Pit would require dewatering, using in-pit sumps, during Operations. The dewatering rates would range from about 156 gpm in the first year, increase to about 377 gpm in the fourth year, and then decline to about 199 gpm in the eighth (final) year of mining the pit.

Sheep Underground Mine. Dewatering from the Sheep I and/or II shafts is scheduled to begin from 1 to 5 years after mining begins in the Congo Pit, and the initial dewatering of the Sheep Underground Mine is anticipated to require continuous pumping at a rate of 750 to 1,000 gpm for a period of approximately 9 months to 1 year (WDEQ, 2015a). After initial dewatering of the Sheep Underground Mine and during Operations, a steady-state dewatering rate of 250 to 400 gpm is expected during the 11 years of mining, based on historical information (WDEQ, 2015a).

Groundwater Withdrawal Impacts. No groundwater data was collected before mining of the Sheep Mountain area began in the late 1950s. However, beginning in the 1970s, groundwater data was collected during periods when mining was active (and dewatering was occurring) and when it was not. Both open pit and underground mining have been active at the site since the late 1950s; however, no actual mining activity has taken place in the Project Area since 1982, though pumping of underground workings was conducted from 1990 through 2000 and minor site reclamation activities were conducted in the 1990s and 2000s. One of the original mine owners, Western Nuclear, initially dewatered the Sheep Underground Mine in the mid-1970s (1974-1976), and discharged treated water to Hanks Draw to the north. Dewatering of the Sheep Underground Mine workings resumed in 1990 and continued until October 2000 (WDEQ, 2015a). During this timeframe, the water was discharged into McIntosh Pit.

The baseline information collected to date and the assessments of historic operations and impacts (Lidstone and Wright, 2013), provide an understanding of the groundwater system so the open pit and underground mine dewatering programs can be designed and conducted as efficiently as possible. An efficient dewatering system would reduce the possibility of pumping more water than necessary. In addition, the information and assessments provide an understanding of drawdown extent and duration due to the Proposed Action. The historical data record, in particular comparison of the historic and current groundwater levels in the Sheep I and II shafts and evaluation of water level changes outside the immediate vicinity of dewatering activities, provides a basis for assessing the impacts associated with the Proposed Action.

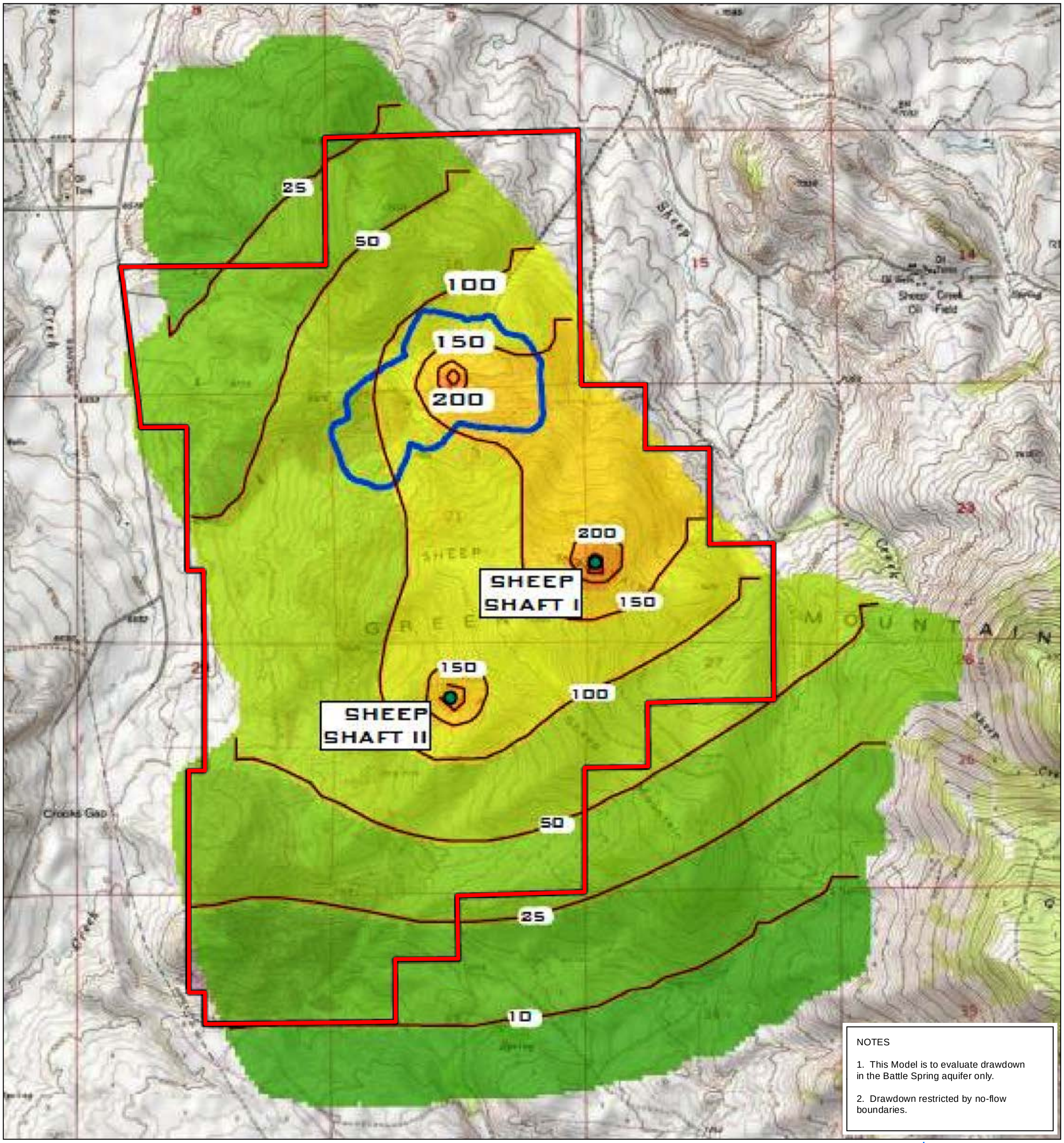
During the dewatering in the 1990s, the dewatering rate was on the order of 250 gpm, and the water level declines in the Sheep I and II shafts were on the order of 1,000 feet, based on available data. Current groundwater levels (Section 3.2.5.2) indicate the water levels have recovered to within 90 percent (or more) of the premining water levels in the 13 years since the dewatering ceased. Because the portions of the extended underground mine would extend about 400 feet deeper into the Project Area Aquifer, groundwater levels would be drawn down to corresponding deeper levels than during the previous underground mining. Pumping rates could be somewhat greater, although duration would be similar to the dewatering during the 1990s. Recovery rates of the groundwater levels after dewatering could be expected to be similar to the historic recovery rates. In addition to the relatively rapid recharge rate, the areal extent of the drawdown from the historic dewatering activities was relatively limited, based on data to the southeast of the Sheep Underground Mine.

Although historic data shows limited extent of influence from drawdown, there is potential for dewatering to create a groundwater sink directly impacting existing groundwater flow within the Project Area during Operations at the Congo Pit and Sheep Underground Mine. The most extensive drawdown would be while the pit and underground mine are being dewatered at the same time. Drawdown and recovery analyses were completed by Energy Fuels in support of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). The results for concurrent dewatering of the Congo Pit and Sheep Underground Mine, which would impose the most stress on the groundwater system, indicates the drawdown would be within the Project Area, except to the south-southeast where up to 50 feet of drawdown could occur at the Project Area boundary, and to the north, where less than 25 feet of drawdown could occur within 1 mile of the Project Area - see Map 4.2-1 (WDEQ, 2015a). The results of the analyses indicate water levels at the Congo Pit would recover completely within about 13.5 years after cessation of mining, assuming the Sheep Underground Mine was not developed. Conservative analysis of the recovery after cessation of mining in the Sheep Underground Mine indicated complete recovery of the water levels would require about 55 years. However, recovery is anticipated to be more rapid because of the increased interconnection in the aquifer due to the underground workings. In addition, initial water level recovery in an aquifer is generally rapid, with last 10 percent to 20 percent requiring the most time (Driscoll, 1986).

Groundwater in the Project Area Aquifer beneath the site is unconfined. Depth to water depends on location within the Project Area and is generally deeper to the east and north, where the ground elevations are higher. Groundwater flow directions identified during studies completed in 1979/1980 and in 2013 were similar, and the flow direction is generally to the west in the Project Area. Groundwater flow directions could be expected to be similar when groundwater levels recover after mining and reclamation.

Drawdown from utilization of water from wells could occur during operations when 10,000 gallons of potable per day are needed. This water is anticipated to come from multiple sources including from the water treatment plant (after amendments), existing wells on-site, and possibly also from Jeffrey City. Potable water would be required to meet EPA regulations, and a permit would be needed from the EPA in order to use a new source for potable water on-site. Water from most existing wells on-site do not currently meet EPA regulations, so treatment would be necessary. Drawdown in existing wells on site would occur as water is pumped at a rate to meet the 10,000 gpd operating requirement. However, per the discussion above, drawdown in these wells will not likely influence the hydrogeologic characteristics of the Project Area aquifer.

Additionally, drawdown in Jeffrey City municipal water wells to supply potable water needs during Construction and possibly Operations could impact the local Jeffrey City water supply and local aquifer (these wells are likely screened in White River Formation referred to as the Arikaree aquifer). However, this aquifer in the Sweetwater River Basin is largely unconfined, and contains potentially large supplies of groundwater indicating drawdown from the Jeffrey City wells would not cause adverse long term impacts.



Map 4.2-1
Projected Extent of Groundwater Drawdown Due to Mine Dewatering

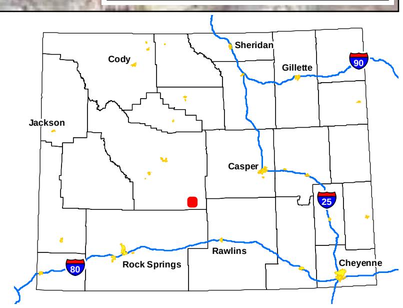
0 4,000 Feet

No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

- Sheep Shafts
- Congo Pit
- Mine Permit Boundary

Drawdown (ft.)

5 - 10
10 - 25
25 - 50
50 - 100
100 - 150
150 - 200
200 - 250
250 - 300
300 - 400
400 - 529.5



Based on creek flow measurements, the elevation of the groundwater table and the flow direction, exchange of some water from the Project Area Aquifer to the alluvial deposits along Crooks Creek is likely. There is no indication in the historic record that historic dewatering activities reduced the groundwater contribution to, or induced recharge from, the alluvial deposits in sufficient quantities to interfere with the flow in the creek. This includes the time period when the water produced by dewatering was pumped to McIntosh Pit, not the Creek.

There is also a spring, Sheehan Spring, to the southeast of the Project Area. The spring is located along the drainage which flows into Western Nuclear Pond and McIntosh Pit. Because the spring is about 2 miles south of the Congo Pit and 1 mile south of the Sheep Underground Mine, dewatering associated with the Project is not likely to interfere with the spring flow. The spring is at an elevation of about 7,050 feet amsl, compared to the regional groundwater elevations of about 6,900 feet in the vicinity of the proposed mining.

Backfill of the Congo Pit and the Sheep Underground Mine. Backfilling the Congo Pit and the Sheep Underground Mine during Reclamation would create areas of less consolidated material within the undisturbed, consolidated Project Area Aquifer. The characteristics and flow regime of the groundwater would be altered because this less consolidated material would generally have a higher permeability than the surrounding rock, allowing for faster recharge and flow through the backfill material. Therefore, the backfill areas could provide faster recharge to the groundwater system. However, the extent of the backfill is small compared to the extent of the formation, so the impact would be minimal. In addition, the historic mining of the Congo Pit and Sheep Underground Mine (Sections 2.3.4.2 and 2.3.4.3) created areas of less consolidated material, and the proposed backfill areas would coincide, in part, with the historic backfill locations. For example, mine voids remaining in the historic underground mine workings beneath the Congo Pit would be replaced with backfilled materials.

Interconnection. The natural heterogeneity of the geologic materials in the Battle Spring and Fort Union formations is augmented by the presence of historic mining-related activities, such as underground workings. Localized, small-scale faults within the Project Area Aquifer also contribute to the heterogeneity within the aquifer. However, the heterogeneity does not restrict groundwater movement throughout the Project Area Aquifer, as evidenced by the consistency of the potentiometric surface before and after intervals of dewatering (e.g., Maps D-6-4 and D-6-10 in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). Historic surface and underground mining within the Project Area have created more permeable pathways (e.g., tunnels, backfilled pits, and slumped layers) within the Project Area Aquifer. Impacts of increased permeability could be beneficial, allowing for more rapid recharge, and/or detrimental, allowing for more rapid movement of contaminants. Because of the areal and vertical extent of the Project Area Aquifer in and near the Project Area compared to the more limited extent of the historic underground disturbance, the additional impact of the increased interconnection within the Project Area Aquifer from the Project would be minimal. In addition, the proposed surface mining (the Congo Pit) would remove many of the underground workings in the vicinity of the pit, and much of the proposed underground mining (Sheep Underground Mine) coincides with historic mining from the Sheep shafts. Therefore, the extent of interconnection within the Project Area Aquifer is not expected to increase substantially.

Groundwater Quality

Potential impacts to the groundwater quality beneath the Project Area relate to mineral oxidation and to spills and leaks. Similar to the discussion of the impacts of the Proposed Action on groundwater quantity and flow, the groundwater quality impacts are evaluated relative to the conditions resulting from the historic mining of the site.

Mineral Oxidation. The potential groundwater quality impacts associated with the Proposed Action include impacts to water quality resulting from potential oxidation of minerals in the aquifer matrix materials of the Project Area Aquifer adjacent to the open pit and the underground mine workings. Oxidation may result in changes in the groundwater pH and in the concentrations of TDS and concentrations of metals and radionuclides. Based on the current groundwater quality, which is influenced by naturally occurring mineralization and by historic mine development and reclamation (see discussion of Groundwater Quality in Section 3.2.5.2), the Proposed Action is not likely to result in a change in the groundwater quality in the Project Area Aquifer sufficient to change the current WDEQ-WQD Class of Use for which the water is suitable. Current groundwater quality and Class of Use are discussed in Section 3.2.5.2. Additional details on the historic mining impacts on groundwater quality and the current groundwater conditions are provided in Appendix D-6 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

The reclamation requirements for the Project would reduce the potential for mineral oxidation. No post-mine pit lake is proposed. The relatively rapid flooding of the backfilled pit and the underground mine after mining, and the selective handling of overburden would reduce the potential for mineral oxidation. In addition, monitoring required per WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) would provide confirmation that excessive mineral oxidation is not occurring. In addition, the WDEQ-AML reclamation of McIntosh Pit (BLM, 2014b) should also reduce the potential for mineral oxidation, which would benefit the Project.

Spills and Leaks. Potential groundwater quality impacts resulting from the Proposed Action include impacts related to a spill or leak from machinery, pipelines, or tanks in use on the surface during Construction, Operations, or Reclamation. Because of the depth to groundwater, direct leakage of a surface spill or leak to the groundwater is considered unlikely and would be the result of a slow leak or catastrophic failure. Within the open pit or underground mine, the potential for a spill or leak to contact groundwater is greater, although dewatering would be designed to keep the groundwater out of the pit and underground mine. Within the On-Site Ore Processing Facility, spills or leaks are also unlikely to contact the groundwater because of the depth to water.

The environmental protection measures to prevent and mitigate spills and leaks include selection of appropriate materials for pipelines and tanks, proper installation and testing of those materials prior to use, and inspection and maintenance. Berms would be placed in and around facilities to control the movement of spills. Storage tanks for fuels and other liquids would comply with Chapter 17 of WDEQ-WQD's rules and regulations on storage tanks (WDEQ, 2012b). Inspections would occur regularly, and should a spill or leak occur, remediation and reporting procedures would be conducted in accordance with the spill contingency plans described in Section 2.3.10.

If the ore were processed on-site, the Heap Leach Pad and other structures, such as the Holding Pond would be lined with leak detection as described in Section 2.3.3.7.1 and meet applicable NRC requirements. Sumps and other drainage systems would also require lining or routing to prevent groundwater discharge from the facility. Leak detection systems would have provisions for monitoring and contingencies for unanticipated conditions. Reclamation requirements would also include provisions for removing liquids, constructing impermeable caps where necessary, and other measures for long-term stability of the site, as well as groundwater monitoring.

4.2.5.4.2 Impacts with Off-Site Processing

The impacts associated with off-site processing would be similar to those described above for on-site processing. However, as mentioned in Section 4.2.5.1.2, water discharged to Crooks Creek under the WYPDES Permit from the Project Area during dewatering would likely dissipate into the soils and sand before reaching the Sweetwater River becoming part of a local alluvial aquifer or leaking into the unconfined Arikaree Aquifer. If this occurs, this water could contribute beneficially to the local groundwater system during discharge activities. The treatment method(s) required under the provisions of the WYPDES Permit specify the parameter(s) of concern for discharge to Crooks Creek, and the BLM must assume that the conditions of the WYPDES Permit are adhered to; therefore, no adverse impacts to overall groundwater quality are anticipated as a result of surface discharge through infiltration into the groundwater system. Any additional impact to groundwater at the Sweetwater Mill is not anticipated considering the project currently exists. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis, as necessary, and applicable rules and regulations would be complied with.

4.2.5.4.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.5.5 Groundwater – BLM Mitigation Alternative

4.2.5.5.1 Impacts

The groundwater resources impacts of the BLM Mitigation Alternative, which includes Reclamation Plan revisions, would not be anticipated to differ significantly from those of the Proposed Action.

4.2.5.5.2 Monitoring and/or Compliance

Monitoring and Compliance under the BLM Mitigation Alternative would be the same as for the Proposed Action.

4.2.5.6 Groundwater – No Action Alternative

The No Action Alternative would not generate any additional impacts to the existing groundwater resources except those already anticipated as a result of Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and WDEQ-AML Project 16-O reclamation plans (BLM, 2014b) for partial reclamation of McIntosh Pit. The WDEQ-AML reclamation plans, in collaboration with Energy Fuels and the landowner, would include backfilling McIntosh Pit above the groundwater table. This reclamation would eliminate evaporative loss of groundwater at the pit and reestablish the groundwater flow direction to the west rather than to the pit.

4.2.5.7 Water Rights and Water Use – Proposed Action Alternative

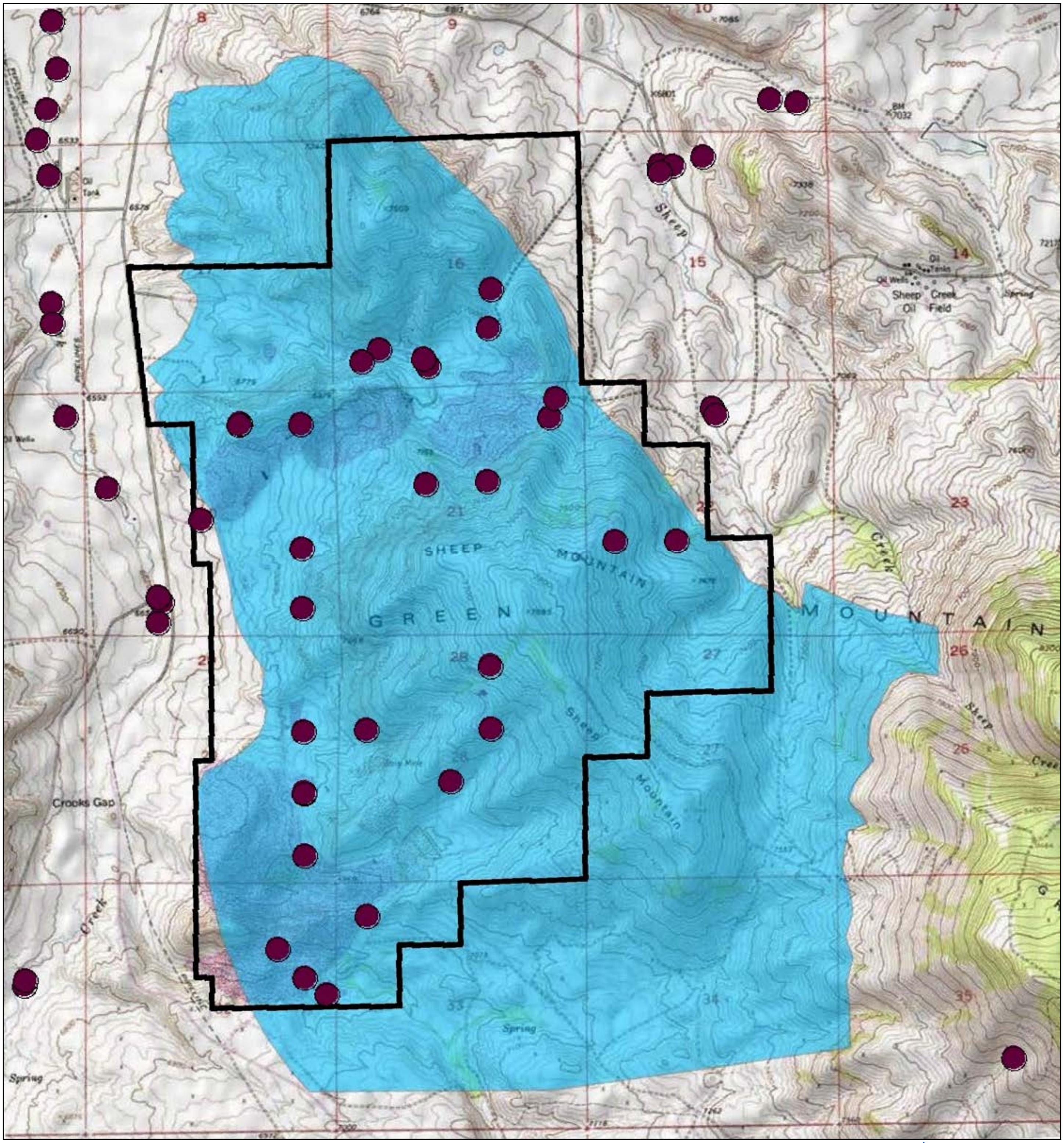
Potential issues associated with water rights and water use are similar to those identified by the BLM through public scoping, internal scoping, and through public comment on the Draft EIS. Issues include:

- Alteration of streamflow characteristics of perennial streams such that established uses by the public and by federal, state, and local agencies for fisheries and wildlife and for livestock, recreational, municipal, and industrial uses are affected;
- Interruption or reduction of the natural flow or level of groundwater to existing local springs, seeps, flowing artesian wells, or permitted water supply wells to the extent beneficial uses cannot be maintained;
- Degradation of water quality to the extent the designated use of the receiving surface or groundwater cannot be maintained.

No impacts to surface water uses would be anticipated. As discussed in Section 4.2.5.1.1, only indirect impacts to surface water flows and quality would be anticipated in the ephemeral drainages, except for those related to dewatering. The indirect impacts would not extend to either Crooks Creek or Sheep Creek. Therefore, existing uses would continue. During Operations, specifically the first two years of dewatering, all of the water from the dewatering operations would be used on-site. After the first two years of dewatering, some of the water from the dewatering operations would be treated and discharged (Section 2.3.10.2). As discussed in Section 4.2.5.1.1, no diminution in flow (or surface water use impacts) are anticipated due to dewatering, and after the first two years of dewatering, temporary additional uses could be possible because of the increased streamflow as a result of the discharge of treated water from dewatering operations. Additional long-term uses could also be possible after Reclamation because historic disturbances in some drainages would be reclaimed, allowing for reestablishment of flow-through drainage and reduced sediment loads to those drainages.

No direct or indirect impacts to groundwater uses are anticipated. No groundwater uses unrelated to mining are known to occur within the Project Area as identified in Chapter 3. Some of the uses identified in Chapter 3 were for previous mining projects, and some are for reclamation activities. The uses for the Proposed Action would be similar to the historic uses, and Energy Fuels has and continues to ensure the appropriate water rights and permits are obtained for these uses. Use of approximately 2,000 gallons of water per day during Construction from Jeffrey City would need to be permitted and allocated through the appropriate agencies and/or organizations; however, this water consumption is not anticipated to cause adverse impacts to the city water supply because Energy Fuels anticipates buying this water from Jeffrey City. Jeffrey City indicates the municipal water supply could handle these drawdowns, and the city's water management would be responsible for allocating this use. Therefore, any potential impacts from this activity would be acceptable. Any identified issues with consumptive use of water would be resolved through Wyoming Statute § 41 (WSEO) policies and procedures.

The calculated zone of influence of the proposed dewatering relative to existing water rights near the Project Area is shown on Map 4.2-2. Based on the assessment of the zone of influence, no existing wells outside of the Project Area would experience drawdown due to dewatering for the Project. All the water rights within the Project Area were acquired by Energy Fuels and the water would be put to the uses specified in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).



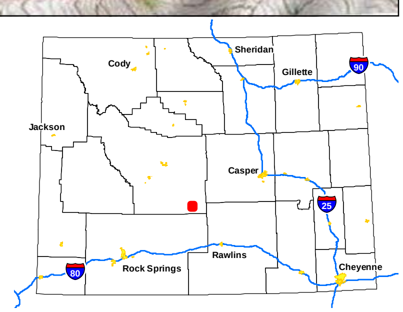
Map 4.2-2
Water Right Locations in Relation to Projected Groundwater Drawdown

- Area Water Rights
- Mine Permit Boundary
- Area of Drawdown From Pumping

N

0 4,000 Feet

No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM



The wells which are related to public drinking water supply, i.e., near the A&M Reservoir and near Jeffrey City, are several miles outside the area of influence of the Project. As discussed in Chapter 3, the distances and geologic setting indicate that groundwater from the vicinity of the Project Area is not likely to be within the capture zone of any public water supply, and the occurrence of natural uranium mineralization throughout the region impacts water quality. Therefore, no direct adverse impacts are anticipated in regards to these public drinking water supplies as a result of the Proposed Action other than those impacts discussed above regarding removal of water from the Jeffrey City water supply during construction and possibly operations.

The Project is located within the North Platte River Basin and potential depletions of surface water or groundwater flowing to the river require evaluation in accordance with the 2001 decision by the U.S. Supreme Court, which established a new legal distribution of the North Platte River among Nebraska, Wyoming, and Colorado. An analysis of the potential depletion due to the Project underground mine dewatering was submitted to the WSEO in 2013. The analysis demonstrated that the dewatering does not increase depletion of North Platte River. This study is provided in Appendix D-6 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a).

4.2.5.7.1 Impacts with Off-Site Processing

The impacts associated with off-site processing would be similar to those described above for on-site processing. Temporary additional surface water uses could be possible because of the increased streamflow due to the discharge of treated water from dewatering operations (Section 4.2.5.1.2). Any additional impact to water use at the Sweetwater Mill is not anticipated considering the project currently exists. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.2.5.7.2 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.2.5.8 Water Rights and Water Use – BLM Mitigation Alternative

4.2.5.8.1 Impacts

The water use impacts of the BLM Mitigation Alternative, which includes revisions to the Reclamation Plan, would not be anticipated to differ significantly from those of the Proposed Action.

4.2.5.8.2 Monitoring and/or Compliance

Monitoring and Compliance under the BLM Mitigation Alternative would be the same as that described above for the Proposed Action.

4.2.5.9 Water Rights and Water Use – No Action Alternative

The No Action Alternative would not generate any additional impacts to the existing water uses or change any of the existing uses except those already anticipated as a result of Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (BLM, 2015a) and WDEQ-AML Project 16-O reclamation plans (BLM, 2014b).

4.3 BIOLOGICAL RESOURCES

4.3.1 Invasive, Non-Native Species and Noxious Weeds

Potential issues associated with invasive, non-native species and noxious weeds were identified by the BLM through public scoping, internal scoping, and public comment on the Draft EIS. Issues include:

- Establishment and growth of weed species due to clearing native vegetation and exposing bare ground surfaces;
- Transporting weeds from established infestations by vehicles and construction equipment; and
- Invasion of weeds and increase in weeds due to dust deposition and other factors.

4.3.1.1 Proposed Action Alternative

4.3.1.1.1 Impacts with On-Site Processing

Surface disturbance (including vegetation removal, topsoil and coversoil removal, spoil storage, and development of the Congo Pit), increased vehicle traffic, equipment placement and operation, foot traffic, and other activities associated with the Proposed Action could increase the distributions of established weed species (see Table 3.3-1) and/or could introduce new invasive species and noxious weeds into areas that are not currently infested. Clearing native vegetation and exposing bare ground surfaces, especially within closed canopy big sagebrush shrub communities, allows invasive species, particularly annuals, to become established at the expense of perennial bunchgrasses (West, 1988). Vehicles could transport weed seeds embedded in dried mud or soils attached to bumpers, undercarriages, and wheel wells. Transport of seeds for more than 100 miles has been documented for vehicles traveling on paved and unpaved roads, and under wet and dry conditions (Taylor et al., 2012).

Weedy annuals such as cheatgrass, halogeton, Russian thistle, and the biennial black henbane, are quick to invade disturbed soils in the Project Area, and can hinder rehabilitation efforts. Invasive plant infestations in the Project Area are expected to increase, which can alter soil health, leading to accelerated erosion and loss of soil fertility, although this depends on other factors such as soil disturbance and climatic conditions. Invasive plant infestations can force out native vegetation and replace it with weedy plants that provide inferior protection to the soil surface (BLM, 2013a). Cheatgrass is present in the Project Area and could provide a fuel load contributing to wildland fires. Fire frequency is increased with cheatgrass invasion; the establishment of cheatgrass causes substantial competition for resources used by native shrubsteppe species (Whisenant, 1990; Knick and Rotenberry, 1997).

Existing infestations of invasive non-native species and noxious weeds within the previously disturbed sites and those that may have become established since the baseline surveys could become established on newly disturbed or re-disturbed surfaces. Of those previously disturbed sites, 572.5 acres would be re-disturbed by the Proposed Action. The re-disturbed sites would be likely sources of noxious weed plants, seeds, and propagules for initiating additional infestations on-site and off-site. This would occur through redistribution of soils by earth moving and increased vehicle travel.

To control invasive, non-native, and weed species, Energy Fuels would implement control measures during all phases of the Project, including seeding and revegetating areas of disturbance as soon as practical with certified weed-free seed; minimizing soil disturbance to the extent possible; using weed-free mulch/straw for erosion control; and selecting and spraying herbicides based on weed species and desired results. In addition, topsoil would be stockpiled, and temporary seeding would be used for soil stabilization on topsoil stockpiles and steep slopes, which would serve as a weed control measure. During Reclamation, the evaluation of reclamation success would take the extent of invasive, non-native, and noxious weeds into account in determining if vegetation cover, productivity, and diversity met the reclamation requirements.

4.3.1.1.2 Impacts with Off-Site Processing

The potential effects associated with invasive non-native species and noxious weeds for off-site processing would be similar to those described for on-site processing. Because off-site processing would include travel from the Project Area to the Sweetwater Mill, there is a greater opportunity for the spread of noxious weeds along Crooks Gap/Wamsutter Road and Minerals Exploration Road. Dust deposition can adversely impact native vegetation by making it more difficult for native vegetation to compete against invasive species. This is much less likely to cause an increase in invasive species than the removal of vegetation and the increase in traffic. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.1.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.3.1.2 <u>BLM Mitigation Alternative</u>

4.3.1.2.1 Impacts

Direct and indirect impacts resulting from the occurrence and spread of invasive non-native species and noxious weeds under the BLM Mitigation Alternative would be similar to those described above for the Proposed Action, but likely to be meaningfully less in severity as a result of the requirements added as mitigation and the obligation to reclaim additional areas.

Implementation of Energy Fuels' site-specific Reclamation Plan, as discussed in Section 2.4, would accelerate establishment of the native plant community. Stable healthy plant communities have the ability to keep invasive species from becoming established.

Energy Fuels would be responsible for submitting and implementing a Weed Management Plan that would address all invasive and non-native species and noxious weeds within the mine permit area including specific emphasis on the reclaimed areas, including cheatgrass, until re-vegetation has been determined to be successful. The plan would identify the frequency of inspection for noxious weed and herbicide spraying by a certified applicator. If noxious or invasive weeds are encountered, the BLM would be consulted for suppression and control methods. A Pesticide Use Proposal (PUP) and written approval from the BLM AO would be obtained prior to usage of herbicides. Pesticide Application Records (PAR) would also be submitted to the BLM AO on a regular basis. An annual Pesticide Use Report (PUR) would be required at the end of each season (INNS-1 in Table 2.4-1). This would further reduce the potential for the occurrence and spread of invasive non-native species and noxious weeds.

Prior to surface disturbance, an invasive plant survey would be conducted by a qualified vegetation specialist. This assessment would show the location and species of invasive or noxious plants and the findings would be presented to the BLM (INNS-2 in Table 2.4-1).

Mobile equipment being transported from an off-site location to the Project Area would be cleaned prior to arrival using water, steam, or air pressurized cleaning methods to remove any invasive or noxious weed seed and plant parts or materials that could contain seeds. When appropriate, sites off public lands where equipment could be cleaned would be identified. Seeds and plant parts would be collected and disposed of appropriately (INNS-3 in Table 2.4-1).

Energy Fuels would be responsible for suppression and/or control of any invasive or noxious plant species within the Project Area. If chemical herbicide control methods are used on public lands, only BLM-approved chemicals and application rates and methods would be allowed (INNS-4 in Table 2.4-1).

All mulch, seed, and other vegetative reclamation materials would be certified weed-free. All sand, gravel, and fill materials would be certified weed-free (INNS-5 in Table 2.4-1).

Annual weed surveys would be conducted during each growing season for the life of the Project. Reconnaissance surveys would be conducted within areas that were recently disturbed by project-related actions during the previous year(s). Survey areas would include 50-foot buffers extending from surface disturbances to adjacent, undisturbed surfaces. Complete surveys of an area plus buffer would be preferred but sampling surveys of an area plus buffer might be required if the disturbed area is large. Weed species, number of plants, and/or area occupied by each weed infestation observed would be reported immediately so that infested areas would be cleared in a manner to minimize transport of weed seed, roots, and rhizomes or other vegetative materials and soil from the site to adjacent weed-free areas (INNS-6 in Table 2.4-1).

4.3.1.2.2 Monitoring and/or Compliance

Monitoring under this alternative would include that described above for the Proposed Action but would also include additional monitoring for invasive non-native species and noxious weeds that would be included in Energy Fuels' Weed Management Plan.

4.3.1.3 No Action Alternative

Under the No Action Alternative, Energy Fuels would be responsible for weed management within the areas bonded for reclamation in the Project Area. Activities that would be conducted under Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and the WDEQ-AML Project 16-O reclamation plans (BLM, 2014b) could potentially reduce invasive non-native species and noxious weeds within the Project Area beyond those that are already occurring.

4.3.2 Vegetation

Potential issues associated with vegetation identified by the BLM through the scoping process and through public comment on the Draft EIS. Issues include:

- Direct removal of vegetation during site clearing;
- Long-term conversion of tree-shrub vegetation (woody vegetation) to less diverse herbaceous vegetation;
- Damage or mortality of plants by dust deposited on photosynthetic surfaces during construction and operation;
- Damage/mortality to plants by dust suppressants (e.g. magnesium chloride solution) and/or road surface de-icers;
- Damage to BSCs;
- Effects on plant pollinators due to habitat alteration, dust, diesel exhaust, and noxious weeds;
- Indirect effects to vegetation by fragmenting patches and along edges created during clearing and grading;
- Uptake of radionuclides in plant roots and leaves from soil and/or water;
- Changes in herbivory by domestic and/or native herbivores caused by displacement from affected areas or attraction to newly re-vegetated sites;

- Introduction or an increase in noxious weeds could alter vegetation cover and species composition, potentially out-competing native plant species; and
- Use of herbicides to control noxious weeds with effects to non-targeted species.

4.3.2.1 Proposed Action Alternative

4.3.2.1.1 Impacts with On-Site Processing

Direct effects to vegetation could occur through removal of vegetation during Construction and Operations. New disturbance is estimated to be 356.5 acres and re-use of previously disturbed areas is estimated to be 572.5 acres for a total of 929.0 acres (see Table 2.3-1 in Chapter 2). The estimated 356.5 acres of new disturbance would include approximately 120 acres of Limber Pine-Big Sagebrush type vegetation and approximately 237 acres of Sagebrush-Grass type vegetation and would be reclaimed. Included in the 572.5 acres proposed for re-disturbance is 314.2 acres that are not classified as reclaimed and 258.3 acres of land that are classified as reclaimed. In summary, 314.2 acres of existing disturbance would be re-used under the Proposed Action and would be reclaimed. About 258.3 acres of reclaimed or currently vegetated areas would be re-disturbed and reclaimed again. Effects to herbaceous vegetation is expected to be short-term (assuming vegetation becomes re-established within 5 years of disturbance), whereas effects to shrub-dominated and forest-dominated vegetation would persist for more than 10 years due to the length of time required for those species to recover. Fall seeding would be done between September 15 and the time that frost prevents preparation of a proper seed bed. Spring seeding would be done after the frost leaves the ground and until May 15th.

Surface disturbance in Sagebrush-Grass and Limber Pine-Big Sagebrush would alter shrub-dominated and tree-dominated vegetation for the long-term. For example, sagebrush can take up to 10 to 15 years to become reestablished (West, 1988). Mature pine-juniper woodlands may be more than 140 years old, originating in pre-settlement times (Miller et al., 2008). Greasewood, bitterbrush, and rabbitbrush re-sprout following fire or mechanical treatments (Church, 2009; Bunting, et al., 1987), including crushing by overland vehicle travel. Big sagebrush does not sprout back from similar effects but will regenerate from seed (West, 1988). Cover is reduced considerably by mechanical treatment of sagebrush (such as crushing); big sagebrush may eventually re-grow from seed and/or survival of damaged plants, depending on precipitation (Yeo, 2009; Summers, 2005).

Damage or mortality to individual plants as a result of decreased light transmission due to dust deposited directly on leaves or other photosynthetic surfaces could occur due to clearing vegetation, operation of earth-moving equipment, and increased traffic along roads during Construction and Operations. Dust from construction and related traffic could impair photosynthesis, gas exchange, transpiration, leaf morphology, and stomata function (Farmer, 1993; Sharifi et al., 1997; Rai et al., 2009). Dust from construction and related traffic could also interfere with plant reproduction by disrupting pollinator activities and plants' physiology (Lewis, 2013).

Baseline conditions revealed radium-226 and other radionuclides in near-surface soils (see Section 3.2.4.4) with highest background radiation levels (gamma exposure rates) measured at historic mine operations (including mine spoils, low grade ore stockpiles, and surface mines, see Map 3.2-9). Uranium and other radionuclides can be transported through the environment and contribute to exposure of biological receptors via atmospheric deposition, dust, runoff, erosion and deposition, groundwater and surface water, and the food chain (Hinck et al., 2010). Radium and other radionuclides can be transferred to plants through uptake from the soil by plant roots and by foliar uptake of radionuclides by plants' external surfaces (Fesenko et al., 2014). Concerns about plant uptake of radionuclides on impacts to human health stem from direct ingestion of plants and/or indirect transfers of radionuclides through food chains (Robertson et al., 2003) that involve domestic livestock and wildlife.

Soil-to-plant concentration ratios, or C_r (concentration ratios are calculated as the concentration of radionuclide in plant tissue divided by the concentration in the soil) reflect numerous chemical and biotic factors that determine effects to plants (Robertson et al., 2003). For example, in a controlled study of three plant species growing on uranium mill tailings, higher concentrations of uranium and radium-226 were observed in the plants growing on the tailings than on control sites (Rumble and Bjugstad, 1986). However, radionuclide concentrations in mill tailing soils were higher, indicating that the plants were not concentrating the radionuclides because C_r were approximately 0.03 (Rumble and Bjugstad, 1986). Field studies of plants growing on natural uranium-containing soils reveal uranium C_r ranging from 0.07 to 4.1 (Robertson et al., 2003). C_r values for radium-226 in native forage plants ranged from 0.78 for shrubs, to 0.1 for native browse, forage and tree species, and 0.3 for lichens and mosses; C_r values for sagebrush, grasses and herbs ranged from 0.05 to 0.7 in high background radium areas (Carvalho et al., 2014), indicating that the plants do not concentrate the radionuclide.

Traffic on Crooks Gap/Wamsutter Road would likely generate dust for some distance from roads and affect existing vegetation, most likely on the west sides of north-south roads, opposite prevailing south-southeasterly winds (Section 3.2.1.1). Project-related traffic is expected to increase fugitive dust which could directly impact roadside vegetation.

As discussed in Section 3.3.5.1, Big Game and Trophy Game, the Project Area provides seasonal ranges for native herbivores (pronghorn, mule deer, elk, and moose) and coincides with two livestock grazing allotments (see Section 3.5.2, Livestock Grazing). Indirect effects to vegetation could occur if the Proposed Action displaced or shifted native and/or domestic herbivores from disturbed sites, leading to excessive browsing and/or grazing on vegetation resources that otherwise would not occur. Alternatively, herbivores could be attracted to unaffected vegetation adjacent to newly revegetated locations, causing excessive browsing and/or grazing following reclamation.

Indirect effects to native vegetation could also occur if invasive, non-native species became established in cleared, disturbed areas and resulted in infestations that might limit or prohibit growth of native and/or desirable species. Weed seeds or plant parts (propagules) of some species could be transported naturally (wind and water) or accidentally (vehicles or other equipment) to disturbed areas. Weed seeds may be present in the native soil materials and the removal of vegetative cover and soil disturbance might promote weed establishment at the expense of desirable species. Vehicles moving on- and off-site could increase distribution of invasive non-native species and noxious weed plants, seeds, and propagules for initiating additional infestations on-site and off-site through redistribution of soils by earth moving activities and increased vehicle travel.

The Proposed Action would disturb vegetation within eight different ecological sites. The most surface disturbance would be to previously disturbed sites identified by the NRCS (see Section 3.3.2) as “Dumps, Mines.” Under this alternative, ecological site characteristics would not be considered for reclamation.

4.3.2.1.2 Impacts with Off-Site Processing

Direct and indirect impacts to vegetation with off-site processing would be similar to those described above for on-site processing. The truck traffic associated with delivery of ore from the Sheep Mountain Project Area to the Sweetwater Mill is expected to generate fugitive dust which could directly impact roadside vegetation on both sides of Crooks Gap/Wamsutter Road. The increased traffic could also contribute to additional infestations of noxious weeds along the road which would indirectly affect native vegetation. Any additional impact to vegetation at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.2.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.3.2.2 BLM Mitigation Alternative

4.3.2.2.1 Impacts

Direct impacts under the BLM Mitigation Alternative would be similar to those described above for the Proposed Action but long-term effects to vegetation could be reduced through implementation of a revised Reclamation Plan dependent upon ecological sites and/or reference areas, reclamation potential, and area resource objectives. In general, previously disturbed surfaces from past mining actions are harder to reclaim and revegetate because they may be devoid of vegetation and contain waste rock derived from former mining activities, consistent with the NRCS “Dumps, Mines” ecological sites (see Section 3.2.4.2).

Sites that had previously been disturbed, with or without reclamation, would be subject to the revised Reclamation Plan, potentially improving affected vegetation communities by requiring additional reclamation and revegetation of more diverse species. The end result is expected to accelerate reclamation processes and lead to more diverse plant communities, concomitant with the pre-disturbance conditions reflected in the Ecological Site Descriptions (see Section 2.4). If on-site processing occurs, the Reclamation Plan revisions would also address previously unreclaimed lands, specifically about 90 acres of previously disturbed areas to offset BLM-managed land that would be permanently taken out of the public domain.

On June 20, 2014, President Barack Obama issued a Presidential Memorandum – Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators as a directive to take new steps to reverse pollinator losses. Compliance with this memorandum would help to reverse pollinator losses.

Implementation of the following measures under the Mitigation Alternative would further reduce impacts to vegetation:

1. At the time of reclamation, Energy Fuels would be required to obtain a BLM-approved seed mix, and a permanent site-wide seed mix would likely not be acceptable (VEG-1 in Table 2.4-1).
2. Genetically appropriate and locally adapted native plant materials (e.g., locally sourced or cultivars recommended for seed zone) would be selected based on the site characteristics, ecological setting, and pre-disturbance plant community (VEG-2 in Table 2.4-1).
3. Locally sourced and/or collected seeds would be used to the extent possible (local collection and logistics should be included in the Reclamation Plan) (VEG-3 in Table 2.4-1).
4. Non-native plants would only be used as an approved short-term and non-persistent (i.e., sterile) alternative to native plant materials (VEG-4 in Table 2.4-1).
5. Energy Fuels would provide data to the BLM on all source material used for reclamation (e.g., where seeds were obtained, where seed originated, year collected, results of

germination and viability tests - these data should accompany seed purchase) (VEG-5 in Table 2.4-1).

6. Energy Fuels would provide the BLM with small samples of all seed used in reclamation, preferably before different species are mixed together (VEG-6 in Table 2.4-1).
7. Seeding would take into account differential handling methods to match germination characteristics of species in the seed mix and consider timing of planting to maximize germination and establishment of all reclamation species (VEG-7 in Table 2.4-1).
8. The Presidential Memorandum-Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators (June 20, 2014) would be complied with (VEG-8 in Table 2.4-1).

Under this alternative, Energy Fuels would be required to comply with a Weed Management Plan that identifies the frequency of inspection for noxious weeds and herbicide spraying by a certified applicator. Implementation of the Weed Management Plan would reduce direct effects to vegetation that would not occur under the Proposed Action.

4.3.2.2.2 Monitoring and/or Compliance

Environmental monitoring during reclamation of the mined portion of the Project Area would focus on the reestablishment of a stable system (see Section 2.3.5, Chapter 2). With respect to surface disturbance, Permit to Mine 381C (WDEQ, 2015a) includes requirements for post-mine topography, drainage reestablishment, and evaluation of revegetation success. As noted in Section 2.3.5.11, when the reclamation is considered complete by WDEQ-LQD, the reclamation bond is released and jurisdiction terminated. There may be additional monitoring with implementation of a revised Reclamation Plan and Weed Management Plan (see Section 4.3.1, Invasive, Non-Native Species and Noxious Weeds).

4.3.2.3 <u>No Action Alternative</u>

The direct and indirect effects to vegetation described above for the Proposed Action and the BLM Mitigation Alternative would not occur under the No Action Alternative. Additional areas that would be reclaimed to offset BLM-managed land permanently taken out of the public domain under the BLM Mitigation Alternative (approximately 90 acres) if ore is processed on-site would also not occur. Activities that would be conducted under Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and the WDEQ-AML Project 16-O (BLM, 2014b) would positively benefit vegetation through the reclamation of currently disturbed areas. The bonded disturbance (144 acres) would be reclaimed by Energy Fuels under the No Action Alternative; and about 302 acres would be reclaimed by WDEQ-AML under Project 16-O. About 190 acres of existing disturbance that are within the proposed disturbance limits would not be reclaimed.

4.3.3 Wetlands and Riparian Zones

Potential issues associated with wetlands and riparian zones were identified by the BLM through the scoping process and public comment on the Draft EIS. Issues include:

- Effects to riparian areas along Crooks Creek resulting from Project-related in-stream flow variations;
- Effects to wetland and riparian vegetation along perennial waterbodies by ore spills, vehicular accidents, accidental release of hazardous materials (e.g., diesel fuel spill, other petroleum compounds); and
- Effects to Western Nuclear Pond.

4.3.3.1 Proposed Action Alternative

4.3.3.1.1 Impacts with On-Site Processing

Jurisdictional wetlands would not be affected by the Proposed Action (see Section 3.3.3).

Direct or indirect impacts to riparian vegetation associated with Sheep Creek are not anticipated because of the overall limited indirect impacts to the Sheep Creek drainage (see Section 4.2.5.1.1). Direct impacts to riparian vegetation associated with Crooks Creek would be negligible because it is likely that any discharge would be to one of the ephemeral drainages tributary to Crooks Creek. Assuming all the discharge reached Crooks Creek (i.e., no evaporation or infiltration) the discharge would not exceed historic creek flow levels (see Section 4.2.5.1.1). Therefore adverse impact to the riparian vegetation is not anticipated (e.g., increased erosion), and the increased streamflow could benefit the riparian vegetation.

Riparian areas associated with Crooks Creek could be potentially impacted, indirectly, due to inadvertent spills or leaks from machinery, pipelines, or tanks into an ephemeral drainage tributary to the creek. This potential is unlikely because measures to control stormwater runoff included in the SWPPP would be implemented.

There would be no direct or indirect effects to Western Nuclear Pond under the Proposed Action Alternative. As discussed in Section 2.5.2, improvements to Western Nuclear Pond are being conducted under the WDEQ-AML Project 16-O (BLM, 2014b). The pond and its associated drainages are south of the Project Area (see Map 2.3-1), and no disturbance of the pond or drainages are planned as part of the Proposed Action.

4.3.3.1.2 Impacts with Off-Site Processing

Potential direct and indirect effects to wetlands and riparian zones associated with off-site processing would be similar to those described for on-site processing. Wetland impacts such as runoff from the road onto any adjacent wetlands (if present), could be greater due to increased traffic on Crooks Gap/Wamsutter Road. However, the measures used to reduce road damage such as water bars and catchments (Section 4.4.6) would reduce the impacts. Impacts to riparian areas associated with Crooks Creek through surface discharge under the approved WYPDES Permit are anticipated to only be minor or non-existent. As described in Section 4.2.5.1.2, based on the highest potential discharge rate (3 cfs for up to 1 year) to Crooks Creek, assuming no evaporation or infiltration, the flow rate would increase 40 percent from the highest recorded flow in the creek (7.6 cfs). This increase in flow in the creek is not likely to change the characteristics of the riparian areas in the creek. Considering average discharge rates (0.6 to 0.9 cfs) and average flow rates in the creek (4.8 cfs downstream of the Project Area), the increase in flow rate (13 to 19 percent) is so miniscule as to be inconsequential to the vegetation and health regimes in these riparian areas. Any additional impact to wetlands at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.3.1.3 Monitoring and/or Compliance

No monitoring is proposed for potential impacts to wetlands.

4.3.3.2 BLM Mitigation Alternative

4.3.3.2.1 Impacts

Impacts to wetlands and riparian zones under the BLM Mitigation Alternative would be similar to those under the Proposed Action. Additional reclamation under the BLM Mitigation Alternative might provide for less potential for erosion and sedimentation, which could benefit surface water quality and riparian vegetation along Crooks Creek downstream from the Project Area.

4.3.3.2.2 Monitoring and/or Compliance

Monitoring and Compliance under the BLM Mitigation Alternative would be the same as for the Proposed Action.

4.3.3.3 No Action Alternative

The No Action Alternative would not generate any additional impacts to wetlands and riparian zones except those already anticipated as a result of Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and WDEQ-AML Project 16-O reclamation plans (BLM, 2014b).

4.3.4 Special Status Species

4.3.4.1 ESA-Listed, Proposed, and Candidate Species – Proposed Action

Potential issues associated with ESA-listed, proposed, and candidate species were identified by the FWS through the Official Species List for the Sheep Mountain Project Area (FWS, 2016) and by the BLM through the public scoping process and through public comment on the Draft EIS. Issues include:

- Potential for water depletions from the Platte River System and effects to ESA-listed species (downstream whooping crane, interior least tern, piping plover, pallid sturgeon, western prairie fringed orchid).

4.3.4.1.1 Impacts with On-Site Processing

The Proposed Action would not directly or indirectly affect ESA-listed species.

An analysis of the potential depletion due to the Project underground mine dewatering was submitted to the WSEO in 2013. The analysis demonstrated that the dewatering does not increase depletion of North Platte River. This study is provided in Appendix D-6 of the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a). No habitat is present within the Project Area that would be suitable to support Ute ladies'-tresses orchid and the Project would have no effect on the species. The possibility of a wolf pack becoming established in the Project Area and vicinity is extremely remote (insignificant and discountable). As such, the Proposed Action would not jeopardize the continued existence of the gray wolf.

4.3.4.1.2 Impacts with Off-Site Processing

Any additional impact to ESA-listed species at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.4.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.3.4.2 ESA-Listed, Proposed, and Candidate Species – BLM Mitigation Alternative

4.3.4.2.1 Impacts

Effects to ESA-listed species under the BLM Mitigation Alternative would be the same as that for the Proposed Action.

4.3.4.2.2 Monitoring and/or Compliance

Monitoring under the BLM Mitigation Alternative would be the same as that for the Proposed Action.

4.3.4.3 ESA-Listed, Proposed, and Candidate Species – No Action Alternative

The No Action Alternative would not generate any additional impacts to ESA-listed species except those already anticipated as a result of Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (BLM, 2015a) and WDEQ-AML Project 16-O reclamation plans (BLM, 2014b).

4.3.4.4 Migratory Birds – Proposed Action Alternative

Potential issues associated with Migratory Birds were identified by the BLM through the scoping process and through public comment on the Draft EIS and include:

- direct mortality ("take") of eggs, juveniles, adults by project construction and operations;
- project-related noise above ambient causing interference with mating displays, juvenile rearing and/or feeding vocalizations;
- decreased nesting success due to edge effects (predation, competition);
- increased edges with smaller habitat patch areas;
- decreased nesting habitat suitability due to effects of dust, suppressants, deicers, etc. to shrub/tree vegetation;
- risk of migratory bird mortality in tailings ponds;
- reducing or preventing the exposure of heavy metals, arsenic, and selenium to migratory birds and other wildlife;
- risk to migratory birds via exposure to hazardous substances such as heavy metals and sulfuric acid;
- potential exposure to radiation during operation and post-reclamation;
- any radioactive zones or open water pits should be outfitted with bird deterrent devices to preclude impacts to avian species;
- direct loss of nesting habitats, conversion of woody vegetation to herbaceous vegetation;
- increased presence of corvids, raptors, and other human-tolerant predators with potential for nest and juvenile depredations;
- potential vehicle-related mortality of scavengers feeding on roadside carrion; and
- potential for raptor electrocutions on new and/or existing power lines: conductor configurations, perching deterrents on poles/cross arms.

4.3.4.4.1 Impacts with On-Site Processing

Most disturbance to previously undisturbed areas would be within sagebrush-grass vegetation and limber pine-big sagebrush vegetation. These vegetation types provide nesting habitats for numerous migratory birds including BCC and BLM-sensitive species: Brewer's sparrow, ferruginous hawk, sage thrasher, loggerhead shrike, and sage sparrow.

In the 2010 MOU pursuant to EO 13186, the BLM committed to identify where take under the MBTA could be reasonably attributable to agency actions that could have a measurable negative effect on migratory bird populations, focusing first on species of concern, priority habitats, and key risk factors. Avoiding surface disturbance during nesting seasons is one approach to lessening take. The BLM suggested that impacts to nesting migratory birds could be minimized or avoided by imposing a timing limitation on use authorizations to mitigate vegetative disturbing activities during the primary portion of the nesting season (BLM, 2007). Surface disturbances that have potential to result in "take" is prohibited in the LFO during the period May 1 to July 15 (or longer if deemed necessary) unless a survey is conducted to determine the presence or absence of nesting migratory birds. For birds observed within the Project Area, the median date that migratory species arrive in Wyoming during spring is April 15. Fall migration for most species is underway by August 15 (Faulkner, 2010).

Ground-disturbing actions during the peak nesting period from May 15 to July 15 and probably into early August for some species could result in nest abandonment, displacement of birds, and possible mortality of nestlings, most likely early in the nesting season (egg laying, incubation) rather than late in the season (Romin and Muck, 2002). Most species will re-nest following a nesting failure, although the number of nesting attempts or re-nesting intensity varies among species (Marten and Geupel, 1993). However, it should be noted that “taking” an individual, nest, or eggs of a migratory bird is unlawful under the MBTA, whether or not the species will re-nest. Risk of mortality of nestlings and dependent fledglings is greater if adults abandon nests late in the season or nests are destroyed prior to fledging young, and could increase if predators are attracted to areas occupied by humans (Andren, 1994; Chalfoun et al., 2002). Displacement of nesting migratory birds from adjacent nesting habitats due to noise, human activity, and dust associated with mining could also occur (Ingelfinger and Anderson, 2004; Knick and Rotenberry, 2002) within a “zone of effect” surrounding Project components. Displacement/avoidance may be short-term if related to noise and human presence, or long-term if related to habitat removal, alteration, and/or fragmentation (Gilbert and Chalfoun, 2011). Disturbances (noise, human activities) to nesting raptors can lead to nest abandonment and nestling mortality (Romin and Muck, 2002; Whittington and Allen, 2008).

Three raptor species have been observed nesting in the Project Area: red-tailed hawk, prairie falcon, and great horned owl. The great horned owl nest currently occupied by red-tailed hawks and a second nest last occupied by red-tailed hawks in 2011 would not be affected by the Proposed Action because they are farther than 0.75 mile from any proposed surface-disturbing activity. Approximately 304 acres would be disturbed within 0.75 mile of the newly discovered red-tailed hawk nest that was active in 2014 (Real West, 2014).

Sagebrush habitats within the Project Area have been fragmented by past mining and would be reduced and isolated further through removal of sagebrush grassland and limber pine-big sagebrush habitats (see Section 4.3.2, Vegetation) that potentially provide nesting habitat for sagebrush-obligate and other migratory birds. Fragmentation of sagebrush shrub-steppe habitats affects breeding densities, nesting success, and nest predation of nesting species (Knick and Rotenberry, 2002). Fragmentation of nesting habitat allows predator access to breeding sites used by birds along newly created corridors and through edges of habitats that were previously continuous. Levels of fragmentation would decline over time with successful revegetation of shrub habitat.

Corvids, including common ravens and American crows, are opportunistic predators and prey on other species’ nests as noted above. Corvids and other opportunistic predators could be attracted to the Project Area as discussed in Section 4.3.4.1.1. Prohibiting on-site trash within the Project Area could reduce attractions for corvids and other potential predators of migratory birds.

Corvids and raptors could use existing power poles and cross arms for perching. Some power pole cross arms within the Project Area have been fitted with anti-perching deterrents (see Avian Power Line Interaction Committee - APLIC, 1994) but deterrents are not present on other power pole cross arms. If the existing power lines are energized, raptors could be electrocuted if birds with adequate wing-span connect between phase conductors (APLIC, 2006 and 2014). Perching deterrents fixed to all power poles in the Project Area would reduce potential predation of migratory birds, similar to the discussion on greater sage-grouse, below.

According to the Plan of Operations (Energy Fuels, 2015a), access to the NRC Restricted Area, which may contain toxic and/or radioactive constituents, would be controlled by fencing (8 foot chain link) to exclude access to the public, wildlife, or livestock. In addition, the ponds would be covered with bird balls to deter waterfowl. Bird balls have been used to hinder birds from using standing water near airports (Harris and Davis, 1998; Transport Canada, 2010) and used to exclude wildlife and prevent mortality at various industrial wastewater impoundments including cyanide ponds, coal-fired power plant evaporation ponds, and acidic water impoundments (FWS, 2009b). Bird balls were reported to eliminate mortality of birds at an oil waste pit but high winds at the site required constant replacement of balls and chronic maintenance to maintain total surface cover (Ramirez, 2010). Bird ball cover adjusts to fluctuating water levels and snow levels but may be affected by winds greater than 50 mph (Harris and Davis, 1998). Project personnel would inspect the ponds on a daily basis to verify adequate coverage by bird balls; identify, record, and report any wildlife mortalities; and where possible, implement measures to reduce or eliminate future occurrences. Any migratory bird mortality would be reported to the FWS Office of Law Enforcement.

Migratory birds could be exposed to radiation during Operations and post-reclamation. As discussed for greater sage-grouse, below, birds appear at higher risk of radiation exposure than other vertebrates because they ingest grit during foraging which could increase radiation dose (Driver, 1994; Hinck et al., 2010). There are no chemical and radiation toxicity data for effects of uranium and radium on birds in general (Hinck et al., 2010). Accumulation of radionuclides in bird tissues will depend on radiation dose which varies based on food source, behavior, and habitat (Hinck et al., 2010). For birds inhabiting aquatic habitats, shorebirds and grebe that fed on insect larvae and herbivorous diving ducks, had higher concentration factors for beta radiation than piscivorous mergansers, river ducks, and omnivorous gulls near the Hanford Site on the Columbia River (Driver, 1994).

In their scoping response, the FWS expressed concern that migratory birds would be exposed to environmental contaminants during the heap leach extraction practice. Exposure to elevated metal concentrations and/or sulfuric acid has led to bird deaths. In one case, birds ingested grit, insects, or impoundment sediments at lead, cadmium and zinc mining, milling, and smelting sites which lead to high tissue concentrations of lead and zinc (Beyer et al., 2004). In another, ponded water on tailings impoundment and stormwater retention impoundments were found to have sufficiently high concentrations of heavy metals to cause injury and death to birds (Stratus Consulting, 2003). Birds ingest acid mine water, especially in semi-arid areas and/or during migrations. A study of relatively low levels of metal contamination in mine waters concluded that “acid metalliferous water bodies pose a significant hazard to wildlife that come in contact with them” (Hooper et al., 2007). Although the Heap Leach Pad would be capped each night with a 4-inch thick, ¾-inch gravel layer, heap leach materials would be exposed during the day when most bird species are active. Energy Fuels does not anticipate that ponding of heap leach solution on the exposed facility would occur.

4.3.4.4.2 Impacts with Off-Site Processing

Potential direct and indirect impacts to migratory birds with off-site processing would be similar to those described above for on-site processing. In addition, effects to migratory bird nesting habitats adjacent to Crooks Gap/Wamsutter Road and Minerals Exploration Road caused by truck traffic to the Sweetwater Mill would be similar to effects described below for greater sage-grouse (see Section 4.3.4.7.1). Any additional impact to migratory birds at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.4.4.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.3.4.5 Migratory Birds – BLM Mitigation Alternative

4.3.4.5.1 Impacts

Direct and indirect effects to migratory birds under the BLM Mitigation Alternative would be similar to those under the Proposed Action. There could be some differences in the post-mine vegetation due to additional measures required by the revised Reclamation Plan and implementation of a Weed Management Plan.

Under this alternative, the following measures are included to reduce effects to migratory birds:

- Surface disturbance in previously undisturbed areas and/or disruptive activities that have the potential to cause destruction of nests, eggs, or young of migratory birds would be prohibited during the period of May 1st to July 15th. A survey of the proposed disturbance areas would be conducted by the proponent to determine the presence/absence of nesting migratory birds. Nest surveys would be conducted no more than 7 days prior to surface disturbing and/or disruptive activities. If no nests, eggs, or young are identified in these areas by this survey, this measure would be waived (MB-1 in Table 2.4-1).
- All open pipes would be screened, capped, or filled to prevent birds from becoming trapped; all exhaust stacks would be screened to prevent bird entry and discourage perching, roosting, and nesting. Caps would be checked regularly (MB-2 in Table 2.4-1).
- In consultation with the BLM, the WGFD, and the FWS, approaches to minimize bird presence on the Heap Leach Pad and exposure to sulfuric acid and sodium chlorate would be explored. If an approach is identified during the required consultation and is implemented, bird death impacts would be minimized (MB-3 in Table 2.4-1).
- New power lines would be constructed to meet or exceed the 2006 and 2014 APLIC Standards and bird deterrents would be installed on existing power lines (MB-4 in Table 2.4-1).
- Sides of all water/fluid impoundments, including sediment ponds, would be sloped enough to allow animals to escape (MB-5 in Table 2.4-1).

4.3.4.5.2 Monitoring and/or Compliance

Monitoring under the BLM Mitigation Alternative would be similar to that for the Proposed Action. Monitoring for mosquito larvae at all water/fluid impoundments capable of providing a medium for mosquito reproduction would be conducted. Fence lines would be monitored for any wildlife mortality. Monitoring for nesting raptors prior to initiating new surface disturbing actions would avoid adverse effects. Daily monitoring for adequacy of bird ball cover and bird mortality would be appropriate for all standing water (Raffinate Pond, Collection Pond, and Holding Pond) with toxic solutions. Any migratory bird mortality would be reported to the FWS Office of Law Enforcement.

4.3.4.6 Migratory Birds – No Action Alternative

The No Action Alternative would not generate any additional impacts to migratory birds except those already anticipated in Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (BLM, 2015a) and WDEQ-AML Project 16-O reclamation plans (BLM, 2014b).

4.3.4.7 BLM and Wyoming Special Status Species – Proposed Action

Potential issues associated with BLM and Wyoming Special Status Species were identified by the BLM through the scoping process and through public comment on the Draft EIS. Issues include:

- Sensitive Animals: Bats
    - Direct mortality – ingestion of fluids in Holding Pond, Collection Pond and/or Raffinate Pond.
    - Potential exposure to radiation during Operations and post-reclamation.
    - Removal of roosts and hibernacula (trees, rock outcrops, abandoned mine adits, and tunnels).
    - Interference with feeding behavior from night-lighting (e.g., mercury vapor lamps) or as barriers to movements
- Sensitive Animals: Prairie dogs and Pygmy rabbits.
    - Direct mortality by vehicle access to site.
- Sensitive Animals: Waterfowl, shore birds, raptors, passerines.
    - See Migratory Birds, above.
- Sensitive Animals: Greater Sage-Grouse
    - Potential effects to seasonal habitats (nesting, brood-rearing, winter habitats) used by greater sage-grouse;
    - Greater sage-grouse mortality due to collision with project-related fencing/structures;
    - Increased presence of corvids and other human-tolerant predators with potential for nest and juvenile depredations;
    - Potential exposure of greater sage-grouse to radiation during Operations and post-reclamation;
    - Potential increase of disease (West Nile Virus - WNV) due to an increase in ponds and surface water; and
    - Project-related noise effects on greater sage-grouse; expected levels above ambient.
- Sensitive Plants: Rocky Mountain Twinpod
    - Direct mortality – removal if present in affected suitable habitats.
    - Effects to plants by dust deposited on photosynthetic surfaces during Construction and Operation.
    - Damage/mortality to plants by dust suppressants (e.g., magnesium chloride solution) and/or road surface deicers.
    - Damage to BSCs.
    - Effects on plan pollinators due to habitat alteration, dust diesel exhaust, and noxious weeds.
    - Introduction or an increase in noxious weeds could alter vegetation cover and species composition, potentially out-competing native plant species.
- Sensitive Plants: Limber Pine
    - Direct mortality – removal of limber pine.
    - Effects to limber pine due to damage or mortality of plants by dust deposited on photosynthetic surfaces during Construction and Operation.
    - Damage/mortality to plants by dust suppressants (e.g., magnesium chloride solution) and/or road surface deicers.
    - Changes in characteristics (shade, temperature, soil moisture, species composition, etc.) that alter suitable habitat.
    - Accidental release of toxic compounds during Construction and/or Operation.

    - o Potential for increased susceptibility to insects (mountain pine beetle) and disease (white pine blister rust) if alternate host plants (e.g., *Ribes*) increase due to the Project along with microclimatological changes over the altered landscape.
- Sensitive Animals: Northern leopard frog
    - o See Wetlands and Riparian Zones (Section 4.3.3).

4.3.4.7.1 Impacts with On-Site Processing

BLM and Wyoming special status species would be directly affected by removal during surface disturbing activities.

Mammals

Increased Project-related traffic is expected to increase vehicle-related mortality of wildlife, including white-tailed prairie dogs and pygmy rabbits, although no estimate of mortality rates is possible.

Activities associated with excavation of the Congo Pit are likely to directly impact bats, causing death and/or abandonment of roosts and hibernacula. Bat day roosts may also be present in conifers and natural rock outcrops that could be removed by the Proposed Action.

Bat species are likely to forage in the Project Area and vicinity. The Proposed Action could directly impact bats by adversely affecting foraging habitats, contaminating surface water, generating noise that could interfere with echolocation, and through night lighting that may alter their behavior. Night lighting would likely occur at construction sites and could act as barriers to bat movements (Kuijper et al., 2008), reduce bat activity in the immediate vicinity (Stone et al., 2009), or have an opposite effect (mercury vapor lamps) by attracting nocturnal insects (Svensson and Rydell, 1998; Rydell and Racey, 1993). Noise from traffic and other sources is believed to interfere with bats' echolocation of insect prey (Jones, 2008). Effects due to noise and night-lighting would be direct impacts to bats. Loss or reduction of foraging habitat can adversely affect bats (Adams, 2003) as an indirect impact.

Bats using the Project Area have likely been exposed to prolonged radiation and chemical hazards associated with past uranium mining. In particular, bats roosting in uranium mines are exposed to radon gas were exposed to higher radon concentrations in winter than during summer. However, bats' respiration rates are lower during winter hibernation and overall adsorbed doses of radon were likely lower in winter than in summer (Schmidt, 2014). Exposure risks through ingestion of insects have not been found.

Bats may also be directly impacted through exposure to sulfuric acid and sodium chlorate if they feed or seek prey in the vicinity of the heap Heap Lleach Ppad, similar to potential effects described for migratory birds, above. Bats drink in flight over open water and observations have suggested that bat mortality has coincided with cyanide-extraction gold mines at several locations in the United States (Clark and Hothem, 1991). However, evidence of ingestion or direct exposure to cyanide and/or heavy metals by bats was not provided. Exposure of bats to sulfuric acid and possibly sodium chlorate used in the heap leach process could occur and potentially cause tissue damage and death.

Birds

Impacts to BLM-sensitive bird species (including aquatic species, raptors, and passerine species included in Table 3.3-4) by on-site processing would be the same as discussed above in Section 4.3.4.4.1, Migratory Birds.

In Wyoming, study results indicate that 95 percent of female greater sage-grouse nested within 6.2 miles from the nest where they were captured (Fedy et al., 2012). Holloran and Anderson

(2005) reported the most distant nest was 17 miles away from the lek of capture. Because there are 13 leks within an approximate 10-mile radius, greater sage-grouse could nest within suitable habitats within the Project Area, but nesting was not reported (Real West, 2011). Noise generated within the Project Area would extend into suitable nesting habitats that are present within the Greater South Pass Core Area, 0.5 mile from the north and 0.4 mile from the south Project Area boundaries.

Machinery used during Construction (backhoes, dozers, graders, mounted impact hammers) produce noise ranging from 80 to 90 dBA 50 feet away (Federal Highway Administration - FHWA, 2011). Sound levels decrease by 6 dBA for each doubling of distance from point sources with an additional decrease of 1.5 dBA if noise is propagated across “soft” ground such as plowed farmland, grass, crops and other vegetation (FHWA, 1995). Ambient sound levels at greater sage-grouse leks in Wyoming range from 16 to 20 dBA with greater sage-grouse present (Patricelli et al., 2012) and noise levels above ambient could interfere with greater sage-grouse acoustic reproductive displays. The closest greater sage-grouse lek is 5.33 miles from the Project Area. Using standard noise attenuation rates, maximum noise (90 dBA at 50 feet) from machinery would be less than BLM’s noise allowance (10 dBa above ambient) at the perimeter of the closest active lek. Project-related noise (80-90 dBA) would exceed ambient levels (16-20 dBA) in nesting and early brood-rearing habitats within 2 to 9 miles from construction sites and could adversely affect the suitability of these habitats.

Mortality of birds, chicks, or eggs due to the Proposed Action could directly affect greater sage-grouse. The Proposed Action would not affect breeding activities on leks. However, greater sage-grouse nests could be destroyed, and birds, chicks, or eggs killed if present in areas subject to surface disturbing activities during the breeding, nesting, and early brood-rearing periods, generally from March 15 through June 30 (WGFD, 2010).

Loss of potential nesting habitat and early brood-rearing habitat due to the Proposed Action would indirectly affect greater sage-grouse populations. The Proposed Action would remove sagebrush-grass vegetation (237 acres) and Limber Pine-Big Sagebrush vegetation (120 acres). The sagebrush-grass vegetation and the Big Sagebrush component of the Limber Pine-Big Sagebrush vegetation type could provide nesting/early brood-rearing habitat for greater sage-grouse. No surveys for greater greater sage-grouse nests were conducted during any of the wildlife surveys. As noted in Chapter 3, most female greater sage-grouse nest within 2.1 to 4.8 miles from leks although distances are highly variable. There are two known active leks (active in 2015) within 6 miles of the Project Area. Greater sage-grouse nesting is possible given the vegetation present, the proximity of multiple leks and core area habitat. Once the Project begins, earth-moving and mining machinery, noise, and dust could affect the suitability of seasonal habitats in the Project Area and female greater sage-grouse may avoid nesting proximate to the disturbances, similar to effects due to noise and activities associated with natural gas development (Lyon and Anderson, 2003).

New fencing would be limited to those areas where it is needed to preclude public access for safety, at all defined points of ingress and egress. Greater sage-grouse have been killed by colliding with barbed-wire fences, typically those that 1) are constructed with steel t-posts, 2) are constructed near leks, 3) bisect winter concentration areas, and 4) border riparian areas (Christiansen, 2009). Markers placed on new barbed wire fence would increase visibility (Christiansen, 2009). Chain link fencing topped with barbed wire is proposed to surround the NRC Restricted Area. Chain-link fence is more visible than 3-strand barbed wire fence, and would be unlikely to be a risk to greater sage-grouse. No Project-related fencing is proposed near any greater sage-grouse leks.

Greater sage-grouse may be at higher risk of radiation exposure than other vertebrates because they ingest grit during foraging which could increase radiation dose (Hinck et al., 2010). Greater sage-grouse feed on sagebrush and herbaceous range plants, all of which can contain radionuclides, including radium-226 (see Section 4.3.2.1.1, above). However, there are no chemical and radiation toxicity data for effects of uranium and radium on birds in general (Hinck et al., 2010), and greater sage-grouse in particular. In general, plant accumulations of uranium are low as reflected by C_r values in Section 4.3.2.1.1 and biomagnification of uranium through food chain transfers does not occur with transfer coefficients less than 1 from plants to foraging terrestrial herbivores (Driver, 1994; Hinck et al., 2010). While bioaccumulation through herbivory may be low, accumulation through other exposure routes including ingestion, inhalation, and dermal contact may increase concentrations in tissues of exposed animals (Hinck et al., 2010). Birds as a group appear at greater risk of exposure from radiation, mostly through ingestion of grit (Driver, 1994), as noted above. LD50/30s (lethal dose to 50 percent of organisms exposed for 30 days) for wild bird species exposed to ionizing radiation ranged from 485 to 2,500 rad (Driver, 1994). There are no data to suggest that greater sage-grouse use of the Project Area during Operations and post-reclamation would be at risk of uranium toxicity or lethal radiation.

Increased predation on greater sage-grouse would be an indirect impact from the Proposed Action. The Proposed Action could attract predators of greater sage-grouse in the Project Area and vicinity and facilitate predation by providing nesting and perching substrates. Corvids are effective nest predators of greater sage-grouse, taking eggs and possibly recently hatched chicks, and their abundance has been related to higher nest predation rates of greater sage-grouse (Hagen, 2009). A recent study observed that greater sage-grouse nested in areas with lower densities of corvid predators (common ravens and black-billed magpies) and raptors (golden eagles and buteo hawks) when compared to higher predator densities at random locations across the landscape (Dinkins et al., 2012). Corvids are often attracted to areas of human development (Marzluff and Neatherlin, 2006). If the Proposed Action caused increased populations of corvids, greater sage-grouse nesting within the vicinity of the Project Area could be affected.

Increased incidence of WNV and potential adverse effects to greater sage-grouse would be an indirect impact from the Proposed Action. Elevated populations of corvids (crows, ravens, jays) have been implicated in local incidence of WNV and increased infection rates by the disease (Reisen et al., 2006). WNV can infect greater sage-grouse; they are highly susceptible to the disease which culminates in death in most infected birds (Clark et al., 2006). Infection of greater sage-grouse likely depends on the presence of standing water, high ambient temperatures, and populations of mosquitos (Walker et al., 2007). In 2013, Fremont County had the most reports of mosquitos testing positive (29) and most cases of humans testing positive (17) for WNV of any county within Wyoming (USGS, 2014). During 2014 and 2015, there were no human cases and only one case involving mosquitos in Fremont County. There is the potential for presence of WNV in the Project Area, possibly less than at lower elevations within Fremont County.

Attraction of corvids to the Project Area would also increase the risk for WNV, as discussed above. Presence of standing water (Raffinate Pond, Collection Pond, Holding Pond) may also contribute to increased local populations of mosquitos although potential toxicities of Raffinate Pond and Holding Pond contents (solutions of sodium chlorate, sulfuric acid, heavy metals, liquid waste) could preclude the presence of mosquitos at those sites. Sediment and collection ponds that would store surface runoff within the Project Area would be more likely to provide growth media for mosquitos.

Amphibians and Fish

Project-related effects to leopard frogs in Crooks Creek, Western Nuclear Pond, and its tributary are not expected. Increases or decreases in instream flows in Crooks Creek would not be likely to cause measureable effects to leopard frogs inhabiting Crooks Creek. No direct or indirect effects to Western Nuclear Pond are anticipated because no new disturbance is proposed within the drainage that feeds Western Nuclear Pond. For reasons provided in Chapter 3, Section 3.3.4.3, there would be no effects to Yellowstone Cutthroat Trout.

Plants

The Proposed Action would affect approximately 4 acres of mapped Rocky Mountain twinpod potential habitat. The affected area of potential habitat, as mapped by BKS (2011b), is within the footprint of an existing road that is used to access the Sheep II pad. There appears to be no chance that Rocky Mountain twinpod plants or potentially suitable habitats would be affected by the Proposed Action.

The Proposed Action would affect 120 acres occupied by limber pine. Based on the average density of 17.9 trees per acre, the Proposed Action would remove an estimated 2,140 limber pine trees from the Project Area including an estimated 214 healthy trees and 1,926 trees infected with white pine blister rust (WPBR).

Mountain pine beetle (MPB) outbreaks and the introduced WPBR fungus increase the potential for high severity fires that ultimately kill pines that survived infections (Burns et al., 2011; Campbell et al., 2010). Wyoming BLM management guidelines (see IM No. WY-2011-041 – BLM, 2011a) recommend seed collection from limber pines that are resistant to WPBR testing protection for use in re-establishing populations. The testing process takes approximately 5 years to determine WPBR resistance, and BLM recommends that unaffected trees be protected from natural and human disturbance until the determination is made. Project-related effects to healthy limber pines could directly affect future conservation of the species. Warming conditions, possibly caused by removing trees and other vegetation which would expose ground surfaces to increased solar radiation, could accelerate the reproduction of MPB and the spread of WPBR (Campbell et al., 2010).

Fugitive dust generated by machinery could directly impact limber pines by coating needles and impeding photosynthesis as described above, under Vegetation. Application of dust suppressants could affect limber pine similar to effects described for Engelmann spruce, lodgepole pine, and ponderosa pine due to uptake of magnesium and chloride from magnesium chloride applied to road surfaces (Goodrich et al., 2008). Energy Fuels would routinely spray site roads with water to control fugitive dust.

Other BLM-Sensitive Species

Project-related effects to leopard frogs in Crooks Creek are not expected.

4.3.4.7.2 Impacts with Off-Site Processing

With off-site processing, there may be effects to sensitive bird species such as greater sage-grouse, burrowing owl, loggerhead shrike, sage thrasher, Brewer’s sparrow, and sage sparrow. Effects to birds species would be similar to those described below for greater sage-grouse. Any additional impact to BLM and Wyoming special status species at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

Decreased nesting habitat suitability could occur near Crooks Gap/Wamsutter Road and Minerals Exploration Road with off-site processing. Project-related traffic on the Crooks

Gap/Wamsutter Road and Minerals Exploration Road would pass through the Greater South Pass Core Area for 23.3 miles, from the Project Area to the Sweetwater Mill. Increased animal-vehicle collisions may also occur due to the increased traffic on Crooks Gap/Wamsutter Road and Minerals Exploration Road.

In 2015, there were nine active leks within 5 miles of Crooks Gap/Wamsutter Road. The closest active lek is 1.0 mile from the road. Noise from diesel dump trucks measured 50 feet away averages 76 dBA (FHWA, 2011). Average noise from dump trucks using the road during pre-dawn from March through May (period of greater sage-grouse lek attendance) would attenuate to 26 dBA at the closest lek. Noise from the loudest dump trucks (84 dBA, FHWA, 2011) would attenuate to 34 dBA. In general, noise that is 4 dBA above ambient levels would be detected by greater sage-grouse and other birds (Dooling and Hulse, 1989). Project-related truck noise would be above ambient levels and would likely be audible to displaying greater sage-grouse at the closest lek 1 mile away from the road and would be above estimated audible detection at three active leks. Additional vehicle-related noise due to the Project may adversely affect greater sage-grouse attendance at three active leks that are <2 miles from the road.

If Project-related traffic occurred during periods of greater sage-grouse attendance at leks, the noise generated by truck traffic could lead to lek abandonment such as described by Blickley et al. (2012a) for natural gas drilling rig noise. The study found that intermittent noise from roads had more of a negative effect on greater sage-grouse lek attendance than continuous noise such as that produced by drill rigs. Chronic noise from natural gas drilling and roads was found to be related to elevated fecal glucocorticoid levels in exposed greater sage-grouse, an indication of endocrine response and increased physiological stress (Blickley et al., 2012b). Chronic stress could lead to long-term decreased fecundity and survivorship, including reduced immune response, and a possible increased susceptibility to WNV (Blickley et al., 2012b).

The presence of nine active leks within 5 miles of Crooks Gap/Wamsutter Road indicates that greater sage-grouse are likely to nest in suitable sagebrush habitats near the road. Dust from Project-related traffic could adversely affect roadside vegetation (see Section 4.3.2.1.1) and potential greater sage-grouse nesting habitat. Light traffic disturbances (ranging from 1 to 12 vehicles per day) during the breeding season were related to reduced nest-initiation rates and increased distances of nest sites away from disturbed leks (Lyon and Anderson, 2003).

Impacts to water sources for greater sage-grouse associated with Crooks Creek through surface discharge under the approved WYPDES Permit are anticipated to only be minor. As described in Section 4.2.5.1.2 and 4.3.3.1.2, the average increase in flow rate (from 4.8 cfs to 5.7 cfs) is so miniscule as to be inconsequential to the vegetation and health regimes of riparian areas along Crooks Creek, and the increase in flow from the lowest recorded flows in Crooks Creek (from 2.3 cfs to 3.2 cfs) may provide more consistent, year-round flow in the creek making greater sage-grouse utilize Crooks Creek more frequently during operations (short term, indirect, beneficial impact). However, once discharge ceases, these birds could be negatively impacted as the water in the creek would decrease, but not disappear, leading to only minor, long term impacts.

4.3.4.7.3 Monitoring and/or Compliance

Monitoring would be similar to that described above for migratory birds under the Proposed Action.

4.3.4.8 BLM and Wyoming Special Status Species – BLM Mitigation Alternative

4.3.4.8.1 Impacts

Direct and indirect effects to BLM and Wyoming sensitive species under the BLM Mitigation Alternative would be similar to those under the Proposed Action. There could be some differences in the post-mine vegetation due to additional measures required by the revised Reclamation Plan and implementation of a Weed Management Plan which could reduce residual impacts to BLM and Wyoming Special Status Species.

Direct and indirect effects to greater sage-grouse by the BLM Mitigation Alternative would be similar to those under the Proposed Action; however, the effects would be reduced with implementation of the mitigation measures described below. There could be some differences in the post-mine vegetation due to additional measures required by the revised Reclamation Plan and implementation of a Weed Management Plan; however, differences in potentially suitable greater sage-grouse habitats are not expected.

All garbage would be collected and managed on-site appropriately then removed from the Project Area at frequent intervals (at least every 2 weeks) to avoid attracting scavengers and avian predators to the area (BWSS-1 in Table 2.4-1). Garbage would attract corvids to the area which could lead to predation of greater sage-grouse nests and juveniles in the surrounding area and could increase the likelihood for transmitting WNV to greater sage-grouse and other birds in the Project Area and vicinity.

Availability of perches can attract corvids and raptors to the Project Area and increase possible predation of greater sage-grouse nests and juveniles in the area surrounding the project. Newly constructed aboveground structures that can serve as perching and nesting sites for corvids and raptors would be equipped with anti-perching devices. Anti-perching devices would also be installed on all existing power line poles and cross-arms on a case by case basis if not already in place (BWSS-2 in Table 2.4-1).

New and existing 3- or 4-strand wire fences would have markers or reflectors to increase visibility for low-flying greater sage-grouse. All new fences would be Type E fences (BWSS-3 in Table 2.4-1).

All water/fluid impoundments capable of providing a medium for mosquito reproduction would be monitored for mosquito larvae. If mosquito larvae in water/fluid impoundments are present, mosquito control would be initiated immediately (BWSS-4 in Table 2.4-1).

If off-site processing occurs, dust control would be applied to the Crooks Gap/Wamsutter road in coordination with the appropriate county transportation department (W-5 in Table 2.4-1). If off-site processing occurs, Energy Fuels would be required to implement procedures to ensure employees adhere to appropriate speed limits within the Project Area and on public roads outside of the Project Area where speed limits are not posted to limit noise and dust produced by trucks traveling on the road during the greater sage-grouse breeding and nesting season (BWSS-5 in Table 2.4-1). If off-site processing occurs, Project-related truck traffic in Core Area during the greater sage-grouse nesting/breeding season would only be allowed between 9 am and 6 pm daily to prevent Project-related noise from detection or exceeding ambient noise at lek perimeters (BWSS-6 in Table 2.4-1). If off-site processing occurs, baseline measurements of ambient noise at lek perimeters facing the Crooks Gap/Wamsutter Road would be made to determine levels of risk to each active lek within 2 miles of the road. If noise levels are anticipated to exceed regulatory thresholds 10dB above ambient at the lek perimeter, the WGFD would need to be consulted to determine appropriate mitigation (BWSS-7 in Table 2.4-1).

Measures described above for greater sage-grouse and migratory birds would be appropriate to minimize effects to BLM and Wyoming Special Status Species. In addition, the BLM may determine if monitoring limber pines that are not infected with WPBR warrant testing to determine WPBR resistance. If so, the BLM would recommend that unaffected trees be protected from natural and human disturbance until the determination is made. If resistant, limber pine cones could be used in re-establishing populations. Alternatively, the BLM may determine that transplanting some of the healthy limber pine trees to previously disturbed areas within the Project Area would be effective reclamation in those sites (BWSS-8 in Table 2.4-1).

To protect breeding raptor species, Energy Fuels would avoid all existing raptor nest sites and surface-disturbing activities during the breeding season (April 1 to September 15 for burrowing owls, and February 1 to July 31 for all other raptors) within applicable nest protection buffers (i.e., 1 mile for ferruginous hawk or 0.75 mile for all other raptors, unless site-specific, species-specific distances are determined and approved by the BLM). Because a number of variables (e.g., nest location, species' sensitivity, breeding, phenology, topographical shielding) determine the level of impact to a breeding pair, appropriate protection measures, such as seasonal constraints and establishment of buffer areas, would be implemented at active nest sites on a species-specific and site-specific basis, in coordination with the BLM. This measure would only apply to operations beginning within these sensitive time frames and within the sensitive buffer areas. It would not apply to ongoing operations continuing through the active breeding season (BWSS-9 in Table 2.4-1).

4.3.4.8.2 Monitoring and/or Compliance

The monitoring and compliance measures that were disclosed for the Proposed Action would apply to the BLM Mitigation Alternative but would also include monitoring for mosquito larvae at all water/fluid impoundments capable of providing a medium for mosquito reproduction. Fence lines would be monitored for any wildlife mortality, including greater sage-grouse.

4.3.4.9 BLM and Wyoming Special Status Species – No Action Alternative

The No Action Alternative would not generate any additional impacts to BLM and Wyoming special status species except those included in Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and WDEQ-AML Project 16-O reclamation plans (BLM, 2014b).

4.3.5 Wildlife

Potential issues associated with terrestrial wildlife species were identified by the BLM through the scoping process and through public comment on the Draft EIS. Issues include:

- Direct mortality by vehicles during all phases of the Project, and poaching coincidental with increased human use;
- Decreased habitat use proximate to the Project components (within a zone of effect) caused by displacement of animals to alternative habitats;
- Removal and alteration of vegetation composition and structure of existing habitats, making them less functional for wildlife;
- Fragmentation of habitats;
- Barriers to animal movements, fencing, and overland ore conveyors;
- Potential exposure to radiation during operation and post-reclamation;
- Effects to habitat from invasive non-native species and noxious weeds; and
- Direct mortality of burrowing species – ingestion of fluids in the Raffinate Pond, Collection Pond, or Holding Pond.

4.3.5.1 Proposed Action

4.3.5.1.1 Impacts with On-Site Processing

Big Game and Trophy Game

Increased vehicle-related mortality due to increased Project-related traffic would directly impact big game. Mule deer in the Sweetwater Herd Unit and pronghorn in the Beaver Rim Herd Unit migrate north and south parallel to Crooks Gap/Wamsutter Road. Mule deer are likely to cross US Highway 287 in the vicinity of Jeffrey City to and from crucial winter ranges. Elk in the Green Mountain Herd Unit also migrate north and south and cross US Highway 287 east of Jeffrey City. Vehicular collisions with big game are most likely to occur where roads with high volume traffic are crossed by migrating big game. A WYDOT map of highway sections with high numbers of reported wildlife collisions include a small portion of US Highway 287 near the Fremont-Natrona border (WYDOT, 2012b). Mule deer-vehicle collisions are expected to increase with increased vehicle presence, particularly on US Highway 287 during winter and spring migrations. Vehicles would likely travel on Crooks Gap/Wamsutter Road at lower speeds than on US Highway 287 during winter. However, Crooks Gap/Wamsutter Road passes through pronghorn crucial yearlong range between Jeffrey City and the Sheep Mountain Project Area which makes wintering pronghorn vulnerable to vehicular collisions.

Traffic could indirectly affect pronghorn, mule deer, and elk distributions in occupied habitats. Big game species tend to move away from areas of human activity and roads, reducing habitat utilization. Displacement of big game is greatest for heavily traveled secondary and dirt roads. Deer displacement distances can reach over 0.5 mile. Deer and pronghorn have been observed to habituate to vehicles as long as traffic is predictable, moving at constant speeds, and not associated with out-of-vehicle activities. Increased vehicular access could induce glucocorticoid stress in animals (Creel et al., 2002; Sheriff et al., 2011) in the vicinity of the Project Area and roads during winter. Mortality would likely be increased if animals, especially juveniles, increased their energy expense, especially travelling through snow during winter (Parker et al., 1984) while escaping from vehicles (Hobbs, 1989).

Public access to the Project Area and vicinity would not change as a result of the Proposed Action; however, human presence would increase in the area. Poaching wildlife is a possible consequence of additional human access within wildlife habitats (Comer, 1982).

Comparative estimates of densities on seasonal ranges that are used by different big game during non-winter seasons (includes spring-summer-fall ranges combined with yearlong ranges) and winter seasons (includes winter ranges combined with yearlong ranges) are provided in Table 4.3-1 for herd units coinciding with the Project Area. The highest expected densities are for pronghorn non-winter ranges in the Red Desert herd unit followed by pronghorn winter ranges in the Beaver Rim herd unit. Potential for indirect impact through Project-related losses of seasonal ranges would depend on the relative densities of animals on those ranges and the area of each range that would be affected (see Tables 4.3-1 and 4.3-2). The Sheep Mountain Project Area is an existing mine site and much of the seasonal ranges in the Project Area are already disturbed or in some state of reclamation.

Table 4.3-1
Estimates of Average Animal Densities Expected on Seasonal Ranges for Big Game Populations in the Project Area

Species and Herd Unit	Post-Harvest Population[1]	Spring-Summer-Fall and Yearlong Range		Winter and Yearlong Range	
		Area (mi^2)	Average Density (animals per mi^2)	Area (mi^2)	Average Density (animals per mi^2)
Pronghorn					
Beaver Rim Herd Unit	13,999	2,025	9.4	873	21.8
Red Desert Herd Unit	11,080	70	158.3	2,889	3.8
Mule Deer					
Sweetwater Herd Unit	3,400	535	6.4	601	5.7
Elk					
Green Mountain Herd Unit	1,400	188	7.4	334	4.2
Moose					
Lander Herd Unit	323	629	0.5	292	1.1

[1] Population estimates from 2014 for pronghorn and mule deer; from 2005 for elk; from 2011 for moose.

Construction would directly remove habitats used by big game within the Project Area. Table 4.3-2 provides the number of areas (acres) in big game seasonal ranges that would be affected by the Proposed Action; however, much of the habitat within these ranges is already disturbed or is previously reclaimed. Specific habitats used by trophy game (mountain lions and black bears) have not been identified but would be expected to mostly coincide with big game wintering habitats within the Project Area and vicinity.

Table 4.3-2
Areas of Big Game Seasonal Ranges that would be Affected by the Proposed Action

Big Game	Herd Unit	Seasonal Range	Seasonal Range Area Affected (acres)	Total Seasonal Range Area in Herd Unit (mi^2)	Percent of Total Seasonal Range Affected
Pronghorn	Beaver Rim	Spring-Summer-Fall	**587.8**	**1,152**	**0.08**
		Winter – Yearlong	**74.9**	**975**	**0.01**
	Red Desert	Winter – Yearlong	**266.2**	**2,889**	**0.01**
Mule Deer	Sweetwater	Yearlong	**351.2**	**383**	**0.14**
		Winter – Yearlong	**577.8**	**218**	**0.41**
Elk	Green Mountain	Winter	**45.0**	**70**	**0.10**
Moose	Lander	Spring-Summer-Fall	**312.7**	**608**	**0.08**

Compared to the amount of seasonal ranges available to each herd unit, the areas affected by the Proposed Action represent a very small proportion of each seasonal range (see Table 4.3-2). An alternative interpretation of effects utilizes the density estimates provided in Table 4.3-1 with the areas affected in Table 4.3-2 to estimate how many animals in each herd unit could be supported by the seasonal ranges affected. For example, the 587.8 acres of Spring-Summer-Fall range removed within the Beaver Rim herd unit would support approximately 8 to 9 pronghorns and 74.9 acres of Winter-Yearlong range removed would support from 2 to 3 pronghorns. In the Red Desert Herd Unit, loss of 266.2 acres of Winter-Yearlong range would support from 1 to 2 animals. While the areas affected contribute to seasonal carrying capacities, the proportion of seasonal ranges available to each population that would be affected by the Proposed Action is small.

Big game animals using seasonal habitats within the Project Area could potentially be exposed to radiation during operation and post-reclamation. Pronghorn and mule deer feed on sagebrush and other browse and elk feed on grasses and herbaceous range plants, all of which can contain radionuclides, including radium-226 (see Section 4.3.2.1.1, above). Ingestion of radium is partitioned into fecal material (80 percent) and the gastrointestinal tract (20 percent); radium adsorbed into the blood stream eventually is eliminated through feces and urine but a portion accumulates in bone tissue (Hinck et al., 2010). Naturally occurring radioactive materials that are characteristic of decay chains of uranium-238 and other sources produce groups of other radionuclides with wide variety of half-lives.

Transfer coefficients are often used to predict transfer of radionuclides to animal food products and depend on adsorption of radionuclides across animals' gastrointestinal tracts (Robertson et al., 2003). However, there are few data related to transfer coefficients for animal products that might be useful to evaluate effects on big game species. Given the relatively low transport of uranium and radium from soil to plants (see Section 4.3.2.1.1, above), the seasonal use of various portions of the Project Area by big game, and the estimates for numbers of animals based on densities in seasonal ranges described earlier, exposures of big game to uranium and radium toxicities and ionizing radiation during operation and post-reclamation are expected to be very limited.

Loss of seasonally used habitat would indirectly impact big game populations through decreased habitat carrying capacities for each of the affected populations (big game herd units). Loss of habitat by the Proposed Action would lead to increased animal densities on unaffected seasonal ranges within each herd unit and may increase demographic population effects by increasing mortality (e.g., through stress, predation, disease, or intraspecific competition), decreasing fecundity (e.g., through nutrition deficits during pregnancy and lactation, fetal resorption, fetal abortion), or by increasing emigration.

Barriers to wildlife movement such as fencing and the conveyor could cause a direct impact to wildlife causing them to alter their movement patterns. This effect is expected to be minimal because the animals may already be avoiding the area due to it being an existing mine site. According to WGFD (2011) most mule deer observations made during early winter classification flights are on the eastern slope of Sheep Mountain, thus the Proposed Action should have minimal effect, if any, on this slope.

Indirect effects to big game could occur from invasive non-native species and noxious weeds interfering with reestablishment of native vegetation species. Many weeds are unpalatable to wildlife (Whitson, et al., 1996). Successful reclamation of vegetated seasonal ranges would provide more suitable habitat, especially on previously disturbed lands. Full restoration of shrub-dominated habitats would occur over the long-term. Noxious weeds often out-compete native vegetation. They displace native species by spreading rapidly and utilizing resources (nutrients, water, sunlight) that can eventually lead to a weed-dominated monoculture. Such transformed habitat can be unsuitable to former wildlife inhabitants. Often, as habitat quality degenerates, wildlife diversity declines.

Upland Game Birds, Small Game, and Furbearers

Direct impacts could occur to small game and furbearers through mortalities from Project-related traffic. Species most susceptible to vehicle-related mortality include those that are inconspicuous, those with limited mobility (skunks), burrowing species (badgers and weasels), have behavioral activity patterns (i.e., nocturnal activity) making them vulnerable (cottontails and furbearers), and wildlife that may scavenge roadside carrion (Leedy, 1975; Bennett, 1991; Forman and Alexander, 1998). Maintaining speed limits would minimize the potential for vehicle collisions with terrestrial wildlife.

Habitats used by wildlife, including upland game birds, small game, and furbearers would be removed. Loss of shrub cover would reduce forage for some herbivores (cottontails), reduce hiding cover and thermal shelter (cottontails), and reduce nesting cover and substrate for birds. Game wildlife species would potentially be displaced by an increase in human activities and from habitats that are cleared of vegetation. Displacement due to habitat removal would extend for the long-term. However, the Sheep Mountain Project Area is an existing mine site and wildlife has most likely acclimated to the area, some of which is already disturbed or is in some state of reclamation.

Upland game birds, small game, and furbearers using habitats within the Project Area could potentially be exposed to radiation during Operations and post-reclamation. Risks of exposures to uranium and radium toxicity and radiation to game birds are expected to be similar to that described for greater sage-grouse in Section 4.3.4.7.1, above. Likewise, risks to small game mammals and furbearers are likely to be low, as described above for big game (Section 4.3.5.1.1).

Badgers dig burrows to hunt burrowing rodents, for shelter and for use as natal dens. Badger burrows can be up to 30 feet long and 10 feet deep and are generally marked by large mounds of soil at burrow entrances (Sullivan, 1996). Badgers could possibly burrow beneath the chain-link fence surrounding the NRC Restricted Area and access toxic compounds at the Heap Leach Pad, Raffinate Pond, Collection Pond, or Holding Pond, all of which would contain toxic and caustic compounds.

Migratory Game Birds

Waterfowl could be directly affected by the Proposed Action if they utilize sediment and collection ponds that would store surface runoff. Similar to effects described for migratory birds, above, waterfowl might attempt to access the Heap Leach Pad. Inhalation of sulfuric acid likely poses the greatest risk along with ingestion and dermal exposure, causing tissue damage and death. Sodium chlorate is an inorganic salt herbicide that may present a risk to migratory game birds if they are exposed to high concentrations of the compound (EPA, 2008). Migratory game birds could be directly impacted by exposure to sulfuric acid and possibly sodium chlorate used in the heap leach process. Use of bird balls would deter waterfowl from accessing the Raffinate Pond, Collection Pond, or Holding Pond containing toxic and caustic compounds.

Non-Game Wildlife

Impacts to non-game wildlife would be similar to those described above for upland game birds, small game, and furbearers.

Fisheries

Project-related effects to native fish and amphibians (including Northern leopard frog) in Crooks Creek are not expected. There would be no direct or indirect effects to fish and amphibians in Western Nuclear Pond under the Proposed Action. Increases or decreases in instream flows in Crooks Creek would not cause measurable effects to fish or amphibians inhabiting Crooks Creek. No direct or indirect effects to Western Nuclear Pond are anticipated because no new disturbance is proposed within the ddrainage that feeds Western Nuclear Pond. As discussed in Section 2.5, improvements to Western Nuclear Pond are being conducted under the WDEQ-AML Project 16-O (BLM, 2014b).

4.3.5.1.2 Impacts with Off-Site Processing

Potential direct and indirect impacts to wildlife associated with off-site processing are similar to those described above for on-site processing but would also include:

- Increased animal-vehicle collisions on the Crooks Gap/Wamsutter Road and Minerals Exploration Road, and
- Decreased habitat suitability near heavily traveled roads.

Truck traffic from the Sheep Mountain Project Area to the Sweetwater Mill would increase the potential for pronghorn-vehicle collisions which would directly impact the population.

Increased traffic on the Crooks Gap/Wamsutter Road and Minerals Exploration Road could decrease habitat suitability for wildlife within some distance on either side of the road. Increased dust from vehicles on the road could affect roadside vegetation and could lead to increased weed infestations along the roadside. Impacts to water sources and vegetation for forage for wildlife associated with Crooks Creek through surface discharge under the approved WYPDES Permit are anticipated to only be minor. As described in Section 4.2.5.1.2 and 4.3.3.1.2, the average increase in flow rate (from 4.8 cfs to 5.7 cfs) is so miniscule as to be inconsequential to the vegetation and health regimes of riparian areas along Crooks Creek, and the increase in flow from the lowest recorded flows in Crooks Creek (from 2.3 cfs to 3.2 cfs) may provide more consistent, year-round flow in the creek making wildlife utilize Crooks Creek more frequently during operations (short term, indirect, beneficial impact). However, once discharge ceases, these wildlife could be negatively impacted as the water in the creek would decrease, but not disappear, leading to only minor, long term impacts. Both effects would indirectly impact wildlife by decreasing suitable habitat. Any additional impact to wildlife at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.5.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.3.5.2 BLM Mitigation Alternative

4.3.5.2.1 Impacts

Potential direct and indirect impacts to wildlife under the BLM Mitigation Alternative would be similar to those described above for the Proposed Action. Additional revegetation and road reclamation that would occur on previously unreclaimed or poorly reclaimed lands disturbed by historic mining in the Project Area could result in differences in post-mine vegetation, but differences in potentially suitable wildlife habitats are not expected between the two alternatives.

Sites that had previously been disturbed, with or without reclamation, would be subject to the revised Reclamation Plan, potentially improving affected vegetation within wildlife seasonal habitats by requiring additional reclamation and revegetation of more diverse species. The end result is expected to be more diverse plant communities, concomitant with the pre-disturbance conditions reflected in the Ecological Site Descriptions. In addition, Energy Fuels would be required to develop and comply with a Weed Management Plan that identifies the frequency of inspection for noxious weeds and herbicide spraying by a certified applicator. Reclamation success of previously disturbed areas would be evaluated and additional reclamation would occur if the areas have not achieved adequate revegetation. If on-site processing occurs, the Reclamation Plan revisions would also address previously unreclaimed lands, specifically about 90 acres of previously disturbed areas to offset BLM-managed land that would be permanently taken out of the public domain.

Also under this alternative, the BLM would require the following measures to minimize potential effects to wildlife:

- Energy Fuels would be required to implement procedures to ensure employees adhere to appropriate speed limits within the Project Area and on public roads outside of the Project Area where speed limits are not posted to minimize big game-vehicle collisions (W-1 in Table 2.4-1).
- human activity on the east slope of Sheep Mountain, at the Sheep I Shaft would be minimized to the extent practicable as to not compromise the safety of the mine from November 15 to April 30 to reduce impacts to wintering mule deer (W-2 in Table 2.4-1).
- fences would be monitored for any wildlife mortalities, including big game (W-3 in Table 2.4-1).
- Wildlife-friendly fencing would be placed around reclaimed areas to facilitate reclamation success. Fences installed for reclamation purposes would conform to BLM's standard fence type (3-wire, 2 barbed, bottom smooth) to facilitate animal migration. Unnecessary existing fencing would be removed to reduce wildlife hazards (W-4 in Table 2.4-1).
- dust control would be applied along Crooks Gap/Wamsutter Road in consultation with the appropriate county transportation department to reduce effects to roadside vegetation/habitat (W-5 in Table 2.4-1).
- through consultation between the NRC and the BLM, the perimeter of the chain-link fence surrounding the NRC Restricted Area would be checked frequently, depending on initial observations, for any signs of mammal or reptile presence (W-6 in Table 2.4-1).
- through consultation between the NRC and the BLM, if signs of small mammal and reptile presence are detected within the NRC Restricted Area (animal presence, carcasses, feces, burrows), a fine mesh wire fence or hardware cloth apron extending 2 feet below the ground surface would be buried around the outside perimeter of the chain-link fence to minimize or eliminate burrowing animals from entering the area. Fine mesh fencing extending to 3 feet above ground around the inside perimeter of the chain-link fence would be placed to prevent smaller, ground-dwelling wildlife (i.e., ground squirrels, chipmunks, and other rodents, lizards, and snakes) from entering tailings cells and evaporation ponds (W-7 in Table 2.4-1).

Implementation of these measures would reduce the potential for impacts to wildlife under the BLM Mitigation Alternative that would not be reduced under the Proposed Action.

4.3.5.2.2 Monitoring and/or Compliance

The monitoring and compliance measures that were disclosed for the Proposed Action would apply to the BLM Mitigation Alternative.

4.3.5.3 No Action Alternative

The No Action Alternative would not generate any additional direct or indirect impacts to the existing wildlife resources or change any of the existing uses except those already anticipated as a result of Energy Fuels' Reclamation Plans in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and the WDEQ-AML Project 16-O reclamation plans (BLM, 2014b). Implementation of existing reclamation plans would increase wildlife habitat in the Project Area and may restore some natural drainages which would positively benefit wildlife.

4.3.6 Wild Horse and Burros

Issues associated with wild horses and the Green Mountain HMA were identified by the BLM through internal scoping and public comment on the Draft EIS. They include:

- Reduced forage due to vegetation removal, fencing, and introduction of invasive species and noxious weeds;
- Potential effects to water quantity and quality; and

- Impairment of the wild and free roaming characteristics of wild horse behavior within HMAs.

4.3.6.1 Proposed Action

4.3.6.1.1 Impacts with On-Site Processing

The Green Mountain HMA and wild horses would be directly impacted by the Proposed Action through forage removal by surface disturbance and additional fencing through all phases of the Project. Approximately 302 acres of new disturbance and 208 acres of disturbance on reclaimed areas would be within the Green Mountain HMA. This direct impact would not be expected to significantly alter the AUM ratio for the designated 170 to 300-horse Appropriate Management Level on the Green Mountain HMA. Additional fencing would be erected within the Project Area (NRC Restricted Area), which partially coincides with the Green Mountain HMA. Due to wild horses' known aversion toward fences, they are likely to avoid newly fenced areas. Alternatively, fencing would prevent horses from entering potentially hazardous areas in the Project Area. The Project Area generally would not be fenced, and existing fences would be maintained. Direct effects could also occur from introduction of noxious weeds and invasive species and removing native vegetation during all phases of the Project.

Diminished surface water quality in water supplies utilized by wild horses (Crooks Creek) could also be a direct impact to wild horses through all phases of the Project. Project design features are in place to ensure that impacts to surface water quality would be minimal, if any (Section 4.2.5, Water Resources).

Indirect effects could also occur during Construction, Operations, and Reclamation, and include increased noise, dust, vehicular traffic, and human activity; both where the Green Mountain HMA overlaps with the Project Area, and outlying access roads. Wild horse-vehicle collisions are rare, and increased traffic is not likely to result horse injuries or death (Section 3.3.6).

These direct and indirect impacts are not expected to alter the HMA objectives, or change the wild, free-roaming nature of the horses in the area. However, it is likely that due to increased human activities, horses would not frequent the area and/or would move to other locations in and off the Green Mountain HMA.

4.3.6.1.2 Impacts with Off-Site Processing

If off-site processing occurs, truck traffic between the Sheep Mountain Project Area and the Sweetwater Mill would increase the opportunity for horse-vehicle collisions. Impacts to water sources and vegetation for forage for wild horses associated with Crooks Creek through surface discharge under the approved WYPDES Permit are anticipated to only be minor. As described in Section 4.2.5.1.2 and 4.3.3.1.2, the average increase in flow rate (from 4.3 to 5.7 cfs) is so miniscule as to be inconsequential to the vegetation and health regimes of riparian areas along Crooks Creek, but the increase in flow from the lowest recorded flows in Crooks Creek (2.3 to 3.2 cfs) may provide more consistent, year-round flow in the creek making wild horses utilize Crooks Creek more frequently during operations (short term, indirect, beneficial impact). However, once discharge ceases, these horses could be negatively impacted as the water in the creek would decrease, but not disappear, leading to only minor, long-term impacts. Any additional impact to wild horses and burros at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.3.6.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.3.6.2 BLM Mitigation Alternative

4.3.6.2.1 Impacts

The direct and indirect impacts for the BLM Mitigation Alternative would be similar to those described above for the Proposed Action. Under this alternative, reclamation could be more successful and might progress faster with the revisions to Energy Fuels' Reclamation Plan. The potential for noxious weed and invasive species would be reduced with implementation of a Weed Management Plan. Fencing of the Congo Pit highwalls would more effectively decrease potential falls, entrapments, or other impacts to wild horses under the BLM Mitigation Alternative than the berms described under the Proposed Action (WHB-1 in Table 2.4-1).

4.3.6.2.2 Monitoring and/or Compliance

No additional monitoring specific to wild horse management would be required.

4.3.6.3 No Action Alternative

Under the No Action Alternative, no uranium mining or ore processing would take place in the Sheep Mountain Project Area and no ore processing would occur at the Sweetwater Mill. Land use activities would continue at levels comparable to that of recent years. Energy Fuel's obligation for previously committed reclamation under WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) would continue under this alternative with the expectation that some forage would be returned. WDEQ-AML Project 16-O (BLM, 2014b) for reclamation of McIntosh Pit would also continue.

4.4 HERITAGE RESOURCES AND HUMAN ENVIRONMENT

4.4.1 Cultural Resources

Potential impacts to cultural resources were identified based on review of existing literature and site records, as well as the results of past and recent Class III pedestrian inventories conducted within the Project Area and through Native American consultation efforts. The impact analysis of cultural resources is based on the following assumptions.

- Number of sites that would be impacted by the Project is directly correlated with the degree, nature, and quantity of surface disturbance within the APE;
- Protection of historic properties would occur in accordance with SHPO consultation requirements and other state and federal regulations; and
- Values that render a cultural resource eligible for the NRHP would dictate what type and kind of impacts are of concern.

For cultural resources, the analysis area is called the area of potential effect (APE). Under Section 106 of the NHPA, the APE is defined as "those areas in which impacts are planned or are likely to occur." Specifically, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking (36 CFR § 800.16(d)). Under this regulation, the APE should include:

- all alternative locations for all elements of the Project;
- all locations where the Project may result in disturbance of the ground;
- all locations from which elements of the Project may be visible or audible;
- all locations where the Project may result in changes in traffic patterns, land use, public access, etc.; and
- all areas where there may be indirect as well as direct effects.

For purposes of this analysis, the APE for direct and indirect effects includes the lands within the Project Area and associated access roads. The APE also includes the Rawlins to Fort Washakie Road and Crooks Gap Stage Station, from which the Project Area is visible. Primary issues related to cultural resources were potential impacts to Native American properties of traditional religious and cultural importance, prehistoric sites and artifacts, and historic sites.

General ground disturbance associated with mining and ore processing could result in direct effects to cultural properties. These include construction of surface infrastructure (Congo Pit, spoils facilities, Ore Pad, On-Site Ore Processing Facility, Conveyor, topsoil stockpiles, building and parking, power lines, and roads), as well as subsurface infrastructure (Sheep I and II shafts, pipelines, and electrical and communication lines). These physical impacts could result in the vertical and horizontal displacement of soil containing cultural materials and the resulting loss of integrity and information, and the alteration of a site's setting.

Potential indirect effects could include the introduction of visual or auditory elements that diminish the integrity of the area's historic features, including setting. Potential indirect effects could include vandalism, inadvertent damage, and illegal artifact collection due to increased numbers of people in and increased access to the Project Area.

4.4.1.1 <u>Proposed Action Alternative</u>

4.4.1.1.1 Impacts with On-Site Processing

Based on information gathered in file searches, LTA cultural reports (as described in Section 3.4.1), and BLM and SHPO consultations, the Proposed Action would not directly affect cultural or historic sites.

As presented in Section 3.4.1, the BLM has determined the setting and viewsheds of the two NRHP-eligible wagon road sections and the Stage Station are weakened by past modern intrusions. SHPO has concurred that setting is no longer an aspect of integrity for these sites. As a result, the Project would have no adverse effect upon historic properties. The Hanks Draw Spoils Facility, located within Hanks Draw, would be greatly shielded from both the wagon road and from visitors traveling by vehicle on Crooks Gap/Wamsutter Road. The majority of the Project components would not be visible from the NHT segments located 7 miles north of the Project Area and the small portions that would be visible consist of existing disturbance. As such, the Project would have no visual impact on NHTs, resulting in No Effect to this historic property.

There is a potential for the unanticipated discovery of archaeological resources during construction and surface disturbing activities and could result in direct effects. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the located resource. Areas of high potential for buried cultural features are immediately adjacent to Crooks Creek, which would not be disturbed. The rest of the Project Area has low potential for buried cultural features. An Unanticipated Discovery Plan for Cultural Resources for the Project would not be necessary.

Site 48FR7357 (the former Continental Materials Corp. mine camp and office area) is within the proposed surface disturbance footprint of the On-Site Ore Processing Facility, near the west border of the Project Area. Recently, SHPO determined that the site is not eligible for listing in the NRHP and found that the Proposed Action would have no effect on the site; however, the BLM and SHPO are requesting physical avoidance of the site. Energy Fuels has offered to install signage along Big Eagle Road or Crooks Gap/Wamsutter Road adjacent to the Project Area during construction of the On-Site Ore Processing Facility that provides a historical overview of uranium mining in the Crooks Gap area.

4.4.1.1.2 Impacts with Off-Site Processing

Direct and indirect impacts to cultural resources within the Project Area with off-site processing would be similar to those described above for on-site processing. The increase in heavy truck traffic on existing county roads is not anticipated to affect cultural resources. Any additional impact to cultural resources at the Sweetwater Mill is not anticipated considering the Project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.4.1.1.3 Monitoring and/or Compliance

No additional monitoring specific to cultural resources would occur under this alternative, unless actions are triggered by unanticipated discoveries.

4.4.1.2 <u>BLM Mitigation Alternative</u>

4.4.1.2.1 Impacts

In addition to the construction and mining elements in the Proposed Action, the BLM Mitigation Alternative provides specific measures that would protect cultural resources from potential impacts. This could result in more successful and expedient reclamation, which in turn, could allow for impacts to the visual setting for cultural resources to be remediated sooner. No additional impacts are expected under this alternative. However, impacts associated with the visual setting for cultural resources could occur for a shorter time due to more successful and expedient reclamation under this alternative.

The BLM, in consultation with SHPO, developed three formal measures to avoid, minimize, or mitigate potential impacts to cultural resources under the BLM Mitigation Alternative. The three measures are described in full detail in Table 2.4-1 in Chapter 2. Mitigation Measure CR-1 ensures that all personnel on-site at the Project would be familiar with the significance of area cultural resources and relevant laws protecting them. Mitigation Measure CR-2 requires that in accordance with 43 CFR § 3809.420 Performance Standards, all Project-related work cease if cultural resources are found on-site during construction or operations. Energy Fuels would be responsible for the costs of evaluation and any necessary mitigation. These two mitigation measures would decrease potential impacts to unknown or unidentified archaeological sites that may occur within the Project Area. The Proposed Action does not stipulate personnel education on cultural resource protection and significance, nor does it indicate Energy Fuels' responsibilities spurred by potential unanticipated resource discoveries.

As noted in Table 2.4-1, Mitigation Measure CR-3 would prevent impacts to site 48FR7357 by requiring physical avoidance and protection during construction. If physical avoidance is not possible, interpretive signage would be developed and installed along public roads by Energy Fuels in coordination with the BLM. With this Mitigation Alternative, the site would be isolated with temporary construction fencing, under the on-site guidance of a BLM-approved archaeologist.

Collectively, the three measures outlined in this alternative could provide action to avoid impacts to and protection of known and unknown existing cultural resources that go beyond those of the Proposed Action. These actions include: personnel education, protection, and avoidance.

4.4.1.2.2 Monitoring and/or Compliance

Monitoring for cultural resource impacts under the BLM Mitigation Alternative would be the same as that described above for the Proposed Action.

4.4.1.3 No Action Alternative

Under the No Action Alternative, no uranium mining or corresponding activities would take place within the Sheep Mountain Project Area. As a result, none of the potential direct or indirect impacts to cultural resources as identified for the Proposed Action would occur. Thus, there would be no residual impacts or need for mitigation and monitoring. Under this alternative, approximately 144 acres under current mine reclamation commitments would be reclaimed. Reclamation would occur within previously disturbed areas; therefore, the potential for identifying new cultural resources at these locations would be minimized. Indirect impacts such as illegal collecting of artifacts and vandalism would be expected to continue at current levels.

4.4.2 Paleontological Resources

The analysis area for paleontological resources is the Sheep Mountain Project Area, including upgraded and maintained access roads. Issues identified during the scoping process for paleontological resources include the potential for loss of important fossil resources due to the following proposed activities or conditions:

- Surface disturbance such as clearing, grading, and excavation in previously unaffected areas; and
- Increased access resulting in vandalism or unauthorized collection.

4.4.2.1 Proposed Action

4.4.2.1.1 Impacts with On-Site Processing

Within the Project Area, direct impacts (destruction or loss of fossils) could occur from construction conducted on formations with potential for important scientific fossil resources (PFYC Class 3, as noted in Chapter 3 Section 3.4.2). Indirect impacts during construction can include damage or loss of fossil resources due to the unauthorized collection of fossils by the public due to increased access to localities near construction areas. Adverse impacts to important fossil resources would be long-term because fossils removed or destroyed are lost to science.

As a result of the recent literature review, pedestrian survey and BLM resource management's knowledge of the area, the probability of fossil resource discovery and impact is considered to be low (Connely, 2011). There are no known existing fossil resources in the vicinity of the Proposed Action.

4.4.2.1.2 Impacts with Off-Site Processing

Off-site processing would occur at an existing processing facility several miles from the Sheep Mountain Project Area. Heavy truck traffic would increase on existing county roads, but impact to paleontological resources would not be expected. Any additional impact to paleontological resources at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.4.2.1.3 Monitoring and/or Compliance

No monitoring for paleontological resources would be required.

4.4.2.2 BLM Mitigation Alternative

4.4.2.2.1 Impacts

Direct and indirect impacts for the BLM Mitigation Alternative would be similar to those described above for the Proposed Action. In accordance with 43 CFR § 3809.420 Performance Standards, if suspected paleontological resources are uncovered during construction, Energy Fuels would suspend all activities in the vicinity of such a discovery and notify the BLM AO as soon as possible. Work in this area would not continue until notified to proceed by the BLM AO. The BLM AO would evaluate, or would have evaluated, such discoveries not later than 5 working days after being notified, and would determine what action would be taken with respect to such discoveries. The decision as to the appropriate measures to mitigate adverse effects to significant paleontological resources would be made by the BLM AO after consulting with Energy Fuels. Energy Fuels would be responsible for the cost of any investigations necessary for the evaluation, and for any mitigative measures (P-1 in Table 2.4-1).

4.4.2.2.2 Monitoring and/or Compliance

No monitoring for paleontological resources would be required.

4.4.2.3 No Action Alternative

Under the No Action Alternative, no uranium mining or ore processing would take place in the Sheep Mountain Project Area and no ore processing would occur at the Sweetwater Mill. As a result, none of the potential direct impacts or unanticipated discoveries on paleontological resources as a result of the Proposed Action or BLM Mitigation Alternative would occur. Reclamation under WDEQ-LQD Permit to Mine 381C (WDEQ, 2015a) and WDEQ-AML Project 16-O (BLM, 2014a) would occur and the probability for fossil discovery would be low given that reclamation would occur on previously disturbed soils.

4.4.3 Tribal and Native American Religious Concerns

As with cultural resources, the area of analysis for properties of traditional religious and cultural significance to Indian tribes is the APE. Under Section 106 of the NHPA, the APE is defined as those areas in which impacts are planned or are likely to occur. Specifically, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause § changes in the character or use of historic properties, if any such properties exist (36 CFR § 800.16(d)).

For purposes of this EIS analysis, the APE for direct and indirect effects to properties of traditional religious and cultural significance to Indian tribes includes the Project Area, the associated access roads outside the Project Area, and historic properties from which the Project Area is visible, including the Rawlins to Fort Washakie Road and Crooks Gap Stage Station. Primary issues related to properties of traditional religious and cultural significance to Indian tribes were potential impacts to Native American properties of traditional religious and cultural importance including traditional cultural properties, sacred sites, or other sites that may be of tribal concern.

Potential impacts to properties of traditional religious and cultural significance to Indian tribes were identified based on review of the existing literature and site records, past surveying, tribal consultations, and a tour of the Project Area with tribal representatives. This review and consultative process identified no areas or sites with properties of traditional religious and cultural significance to Indian tribes within the Project Area. The Eastern Shoshone were concerned about impacts to the Rawlins to Fort Washakie Road because it was used to bring government commodities (according to treaty rights) to the tribe from Rawlins. During tribal consultation they agreed that the visual impacts of the Project would be No Adverse Effect.

4.4.3.1 Proposed Action

4.4.3.1.1 Impacts with On-Site Processing

Ground disturbance, including the installation of surface and subsurface infrastructure, could potentially result in direct effects to properties of traditional religious and cultural significance to Indian tribes. However, because no areas or sites with properties of traditional religious and cultural significance to Indian tribes have been identified within or near the Project Area, no direct or indirect impacts are expected during Construction, Operations, or Reclamation.

The potential exists that unanticipated sites with properties of traditional religious and cultural significance to Indian tribes could be discovered during project construction and mining in the Congo Pit, and could result in direct effects. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the discovered site.

4.4.3.1.2 Impacts with Off-Site Processing

If Sheep Mountain ore is processed off-site, the direct impacts to properties of traditional religious and cultural significance to Indian tribes would be unchanged from those evaluated with on-site processing. Increased truck traffic on Crooks Gap/Wamsutter Road and Minerals Exploration Road, between the Project Area and the Sweetwater Mill, would not be expected to result in indirect impacts to properties of traditional religious and cultural significance to Indian tribes. Any additional impact to Tribal and Native American religious concerns at the Sweetwater Mill is not anticipated considering the project currently exists without requiring new disturbance. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analysis as necessary.

4.4.3.1.3 Monitoring and/or Compliance

No monitoring or compliance procedures are required for the Proposed Action Alternative unless such actions are triggered by unanticipated discoveries.

4.4.3.2 BLM Mitigation Alternative

4.4.3.2.1 Impacts

Potential direct and indirect impacts to properties of traditional religious and cultural significance to Indian tribes under the BLM Mitigation Alternative would be unchanged from those for the Proposed Action. In the event that properties of traditional religious and cultural significance to Indian tribes were discovered during Project activities, Energy Fuels would stop working in that area and notify the BLM AO. Work would continue in that area with approval of the BLM. Energy Fuels would be responsible for the costs of evaluation, tribal consultation, and any necessary mitigation (TNA-1 in Table 2.4-1).

4.4.3.2.2 Monitoring and/or Compliance

No monitoring or compliance procedures are required under the BLM Mitigation Alternative unless actions are triggered by unanticipated discoveries.

4.4.3.3 No Action Alternative

Under the No Action Alternative, no uranium mining or ore processing would occur in the Sheep Mountain Project Area and no ore processing would occur at the Sweetwater Mill. As a result, none of the potential direct or indirect impacts to properties of traditional religious and cultural significance to Indian tribes identified for the Proposed Action would occur, and there would be no residual impacts or need for mitigation and monitoring. Approximately 144 acres under current mine reclamation commitments would be reclaimed by Energy Fuels under the No Action Alternative (see Map 2.5-2). Reclamation would occur within previously disturbed areas; therefore, the potential for identifying new sites with properties of traditional religious and cultural significance to Indian tribes would be minimized.

4.4.4 Socioeconomic

The Proposed Action and BLM Mitigation alternatives have the potential to affect socioeconomic conditions in Fremont and Carbon counties. Potential issues associated with socioeconomic conditions were identified by the BLM through internal scoping, consultation with cooperating agencies, and comments provided through the public scoping process, and include the following:

- Potential impacts to motels and other short-term housing accommodations during Construction;
- Potential demands for housing and public services or infrastructure that would exceed capacities in these systems; and
- Potential that the Proposed Action could contribute to boom-bust development patterns often associated with mineral development.

Direct impacts to socioeconomic conditions would include an increase in employment and income due to the Construction, Operations, and Reclamation jobs created by the Proposed Action, population changes due to relocating Project workers, and changes in local government finances due to uranium production and Project spending. Direct impacts to population were analyzed by comparing estimated Project-driven in-migration with current and projected population levels. Direct impacts to public finances were evaluated by estimating severance, property (ad valorem), and sales tax revenues stemming from the Proposed Action.

Indirect impacts would include changes in employment and income related to jobs supporting the Proposed Action and its employees, changes in the demand for housing and community services, and changes to local government finances through taxable household spending. The IMPLAN model was used to estimate the total employment in Fremont and Carbon counties associated with Construction and Operations. Impacts to housing and community services were evaluated by comparing estimated Project-driven household growth with current and projected household levels and existing service levels for education. Indirect impacts to public finances were evaluated by estimating the sales tax revenue associated with household spending of income derived from the Proposed Action.

Estimated impacts to socioeconomic conditions are based on the following assumptions:

- the Study Area includes Fremont and Carbon counties.
- the local workforce is defined to include workers from Fremont and Carbon counties, and the non-local workforce is defined to include workers who live outside these counties.
- local workers are expected to comprise approximately 50 percent of the Construction workforces for the Congo Pit and Sheep Underground Mine and 30 percent of the Construction workforce for the Heap Leach Pad/ Ore Processing Facility. Remaining portions of the Construction workforce are expected to be non-local workers who would work in the area on a temporary basis while maintaining their permanent residence elsewhere.
- local workers are expected to comprise approximately 50 percent of the Operations workforces at the Congo Pit and Sheep Underground Mine and 35 percent of the Operations workforce at the Heap Leach Pad/Ore Processing Facility. Remaining portions of the Operations workforces are expected to include non-local workers who relocate to the Study Area.
- the increase in indirect and induced jobs associated with the Proposed Action is expected to be filled through the local labor force and would not result in additional population increases in the Study Area.

Construction, Operations, and Reclamation are expected to occur within 20 years.

4.4.4.1 Proposed Action

4.4.4.1.1 Impacts with On-Site Processing

The direct employment associated with the Proposed Action would be a key driver of the Project's socioeconomic impacts. Table 4.4-1 summarizes the proposed workforce levels in the Project Area with on-site processing as discussed in Section 2.3.7. Residents of the Study Area ("local workers") are expected to comprise approximately half of the Construction, Operations, and Reclamation workforces for the Congo Pit and Sheep Underground Mine, and non-local workers are expected to account for the remaining half. Local workers are expected to account for approximately 30 percent of the Construction workforce, 35 percent of the Operational workforce, and 50 percent of the Reclamation workforce at the Heap Leach Pad and On-Site Ore Processing Facility, with non-local workers accounting for the remainder.

Table 4.4-1
Construction, Operations, and Reclamation Workforce Requirements

Project Component	Duration	Number of Workers		
		Local	Non-Local	Total
Construction				
Congo Pit	2 – 4 months	10	10	20
Sheep Underground Mine	18 months	25	25	50
Heap Leach Pad/Ore ProcessingFacility	9 months	33	77	110
Operations				
Congo Pit	8 years	21	20	41
Sheep Underground Mine	11 years	64	64	128
Heap Leach Pad/Ore Processing Facility	12 - 16 years	12	23	35
Reclamation				
Congo Pit	5 years	12	12	24
Sheep Underground Mine[1]	1 – 2 years	3	3	6
Heap Leach Pad/Ore Processing Facility[2]	2 – 3 years	12	12	24

[1] Demolition of buildings and placement of mine seals would occur over an approximate 8 month period (Energy Fuels, 2015a). Additional closure and reclamation tasks at the Sheep Underground Mine would be conducted during the remainder of the Reclamation phase (Morrison, 2014).

[2] Reclamation of the Heap Leach Pad/Ore Processing Facility would require an earthwork crew of 12 workers during construction seasons (6 to 8 months per year), and a six-man demolition crew and six supervisory and health and safety personnel working on a year-round basis (Energy Fuels, 2015a; Morrison, 2014).

Based on the workforce levels shown in Table 4.4-1 and the construction schedule outlined in Section 2.3.6, Figure 4.4-1 shows the estimated Construction, Operations, and Reclamation workforces. The figure illustrates the Proposed Action's staggered development schedule. Construction of the Congo Pit would coincide with the latter half of the Heap Leach Pad and On-Site Ore Processing Facility's Construction phase. The Sheep Underground Mine would be constructed 1 to 5 years after the start of the Congo Pit and processing operations. Based on the Preliminary Feasibility Study for the Sheep Mountain Uranium Project (BRS, 2012), this analysis assumes that the Sheep Underground Mine would be developed during Years 4 and 5 of the Project's life. Much of the Congo Pit's Reclamation would occur concurrently with Operations and Reclamation of the Congo Pit would overlap with Operations of the Sheep Underground Mine and Heap Leach and On-Site Ore Processing Facility.

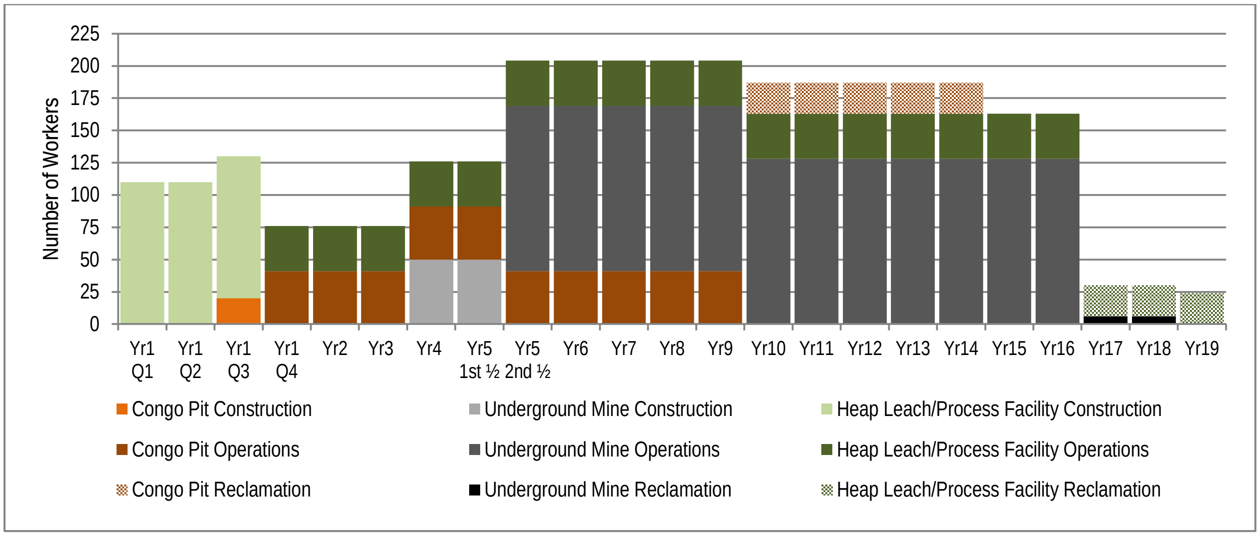


Figure 4.4-1
Proposed Action with On-Site Processing: Estimated Workforce

An analysis of the demographic and economic characteristics of the portions of Fremont and Carbon counties that surround the Project Area suggests that the region, which includes the towns of Lander, Riverton, and Rawlins, could provide approximately 290 workers to the Sheep Mountain Uranium Project (see Table 4.4-2). This estimate is based on several assumptions, including the portion of unemployed workers in Fremont and Carbon counties that would be interested in working at the Project, the portion of Fremont County residents commuting to other counties for work and who would be interested in working at the Project, and the portion of applicants that would qualify for work at the Project. Overall, the analysis indicates that the Study Area has the ability to provide the estimated local workforce.

Table 4.4-2
Estimated Potential Local Workforce

Employment Measure	Jeffrey City CCD	Lander CCD	Wind River CCD	Rawlins CCD	Total
2012 population[1]	92	10,876	26,635	10,940	48,543
Civilian Labor Force[1]	27	5,873	13,570	5,612	25,082
2013 county unemployment rate[2]	5.9%	5.9%	5.9%	4.5%	--
Percent of Fremont County CCD residents working in other counties	NR[3]	6.7%	3.9%	NA[4]	--
Prospective applicants at the mill[5]	1	185	332	63	581
Potential workers from the local area[6]	0.5	92	166	32	290

[1] Source: Census Bureau, 2013a.
[2] Source: BLS, 2014b.
[3] NR = Not Reported.
[4] NA = Not Applicable. The Rawlins CCD is in Carbon County.
[5] Assumes that 25 percent of unemployed labor force participants in Fremont and Carbon counties and 25 percent of Fremont County residents who live in the Jeffrey City, Lander, and Wind River CCDs would be interested in working at the Sheep Mountain Project.
[6] Assumes that 40 percent of applicants possess the relevant job skills and pass drug tests.

Economic Conditions

Direct Project employment and spending would stimulate economic activity in the Study Area by supporting secondary job growth and increasing labor income and regional output. Economists estimate a project's total economic impacts using mathematical analysis that captures the supply and demand linkages between industries and measures the subsequent rounds of spending within the local economy that are associated with an initial expenditure. The current analysis used the IMPLAN regional economic modeling software, calibrated with economic data for Fremont and Carbon counties, to estimate the total employment and income effects associated with the Proposed Action. IMPLAN was originally developed by researchers at the University of Minnesota in cooperation with the Forest Service, the BLM, and the Federal Emergency Management Agency (FEMA) to assist in land and resource management planning. Later commercialized, IMPLAN is now a widely accepted analytical tool to examine local economies across the United States.

The economic impacts estimated by IMPLAN are constrained by the Study Area specified for the analysis, and include:

- **Employment**: The total annual average jobs in the Study Area, including all full-time and part-time jobs for employees and self-employed workers. Because this definition is based on annual average employment, IMPLAN's employment estimates also account for seasonal workers. The 20 workers employed for one quarter in Year 1 constructing the Congo Pit account for 5 annual jobs in the IMPLAN analysis, and the 41 workers who mine (operate) the Congo Pit for one quarter in Year 1 account for 10.3 annual jobs.
- **Labor Income:** The total value paid to workers in the Study Area.
- **Value Added:** The total value of all non-commodity payments associated with production. Value Added indicates the economic growth within the Study Area (gross regional product) attributable to the Project.
- **Output:** The total value of spending within the Study Area, including the value of final output and intermediate purchases (money spent purchasing goods and services used to produce final output).

IMPLAN further distinguishes these impacts into the following effects:

- **Direct Effects** represent Energy Fuels' initial spending on the Sheep Mountain Uranium Project in the Study Area.
- **Indirect Effects** estimate spending in the Study Area by businesses that supply goods and services to the Sheep Mountain Uranium Project.
- **Induced Effects** represent spending in the Study Area by households that earn income from the Sheep Mountain Uranium Project (*Direct Labor Income*) and from businesses that supply goods and services to the Sheep Mountain Uranium Project (*Indirect Labor Income*).

The current analysis used IMPLAN Version 3.1, which is based on 2012 industry spending patterns and levels. All future expenditures associated with the Proposed Action were discounted to 2012 dollars before conducting the analysis, and all expenditures and income estimated by the model and reported below are expressed in 2012 dollars.

Employment and Income Impacts. During the Project's first year, when the Congo Pit, Heap Leach Pad, and On-site Ore Processing Facility would be constructed and Operations begin, direct Project employment would include 106 jobs. Energy Fuels expects to spend approximately $4 million in the Study Area in Year 1, including approximately $3.6 million on labor expenditures. Project and worker spending would support approximately 12 indirect and induced jobs in the Study Area; labor income associated with this employment would approximate $473,757. Output in the Study Area would expand by approximately $1.85 million during Year 1 of the Proposed Action with on-site processing (see Table 4.4-3).

During Project Years 2 and 3, when the Congo Pit, Heap Leach Pad, and Ore Processing Facility would be operating, direct Project employment would include 76 jobs per year. Energy Fuels would spend approximately $7 million in the Study Area each year, including approximately $4.6 million on annual labor expenditures. Project and worker spending would support approximately 21 indirect and induced jobs in the Study Area annually; labor income associated with this employment would average $726,340 per year. Output in the Study Area would expand by approximately $2.2 million annually during Years 2 and 3 of the Proposed Action with on-site processing.

Between Project Years 4 and 5, when the Congo Pit, Heap Leach Pad, and Ore Processing Facility would be operating and the Sheep Underground Mine would be constructed and begin Operations, direct Project employment would average 146 jobs per year. On average, Energy Fuels would spend approximately $9.5 million in the Study Area each year, including $5.3 million on annual labor expenditures. Project and worker spending would support approximately 21 indirect and induced jobs in the Study Area each year; annual labor income associated with this employment would average $947,685. Output in the Study Area would expand by an average of $3.2 million annually during Years 4 and 5 of the Proposed Action with on-site processing.

During the years of peak production (Project Years 6 through 16), direct Project employment would average 189 jobs per year. Averaged over this period, Energy Fuels would spend approximately $17.1 million in the Study Area each year, including $6.6 million on annual labor expenditures. Project and worker spending would support approximately 28 indirect and induced jobs in the Study Area annually; labor income associated with this employment would average approximately $1 million per year. During this time, output in the Study Area would expand by an average of $5.2 million annually.

Table 4.4-3
Proposed Action with On-Site Processing:
Average Annual Economic Impacts to the Study Area[1]

Impact Measure	Project Year 1	Project Years 2 – 3	Project Years 4 - 5	Project Years 6 – 16	Project Years 17 - 19
Employment[2]					
Direct	106	76	146	189	24
Indirect	5	4	7	7	5
Induced	7	17	19	21	3
Total	118	97	172	217	32
Labor Income					
Direct[3]	$3,633,328	$4,617,400	$5,255,790	$6,605,249	$497,068
Indirect	$230,082	$162,648	$311,107	$320,327	$191,637
Induced	$243,675	$563,692	$636,579	$706,196	$85,426
Total	$4,107,085	$5,343,740	$6,203.476	$7,631,772	$774,131
Value Added					
Direct	$969,103	$625,734	$1,258,344	$3,070,199	$1,112,289
Indirect	$363,301	$336,856	$568,780	$665,434	$344,090
Induced	$521,732	$1,206,946	$1,362,999	$1,512,063	$182,903
Total	$1,854,136	$2,169,536	$3,190,123	$5,247,696	$1,639,282
Output					
Direct[4]	$3,989,568	$6,957,450	$9,534,197	$17,137,414	$2,739,308
Indirect	$670,965	$645,615	$1,068,581	$1,271,845	$627,779
Induced	$824,991	$1,908,511	$2,155,264	$2,390,980	$289,215
Total	$5,485,524	$9,511,576	$12,758,042	$20,800,239	$3,656,302

[1] Source: IMPLAN v.3.1 data for 2012: Fremont and Carbon counties.
[2] Total annual average jobs, including all full-time, part-time and seasonal jobs. Total annual jobs equals the number of workers employed during a year multiplied by the portion of the year they are employed.
[3] Based on annual labor expenditures reported in BRS Engineering, 2012.
[4] Based on annual expenditures reported in BRS Engineering, 2012.

During final Reclamation (Project Years 17 through 19), direct Project employment would average 24 jobs per year. On average, Energy Fuels would spend approximately $2.7 million in the Study Area each year, including $497,068 on annual labor expenditures. Project and worker spending would support approximately eight indirect and induced jobs in the Study Area each year; annual labor income associated with this employment would average $277,063. During this time, output in the Study Area would expand by approximately $1.6 million annually.

Population

Construction and Operations are expected to attract workers from across Wyoming, as well as workers with specialized skills from neighboring states. Under the Proposed Action with on-site processing, net labor migration into the Study Area would occur periodically over the first 5 years of Project life, as Project facilities are constructed and become operational.

Construction projects typically attract transient non-local workers who work at job sites on a temporary basis while maintaining their permanent residence elsewhere. This tendency would apply to non-local construction workers at the Heap Leach Pad and Ore Processing Facility, where construction would require a variety of general and specialized contractors who typically supply their own crews. Therefore, the non-local workforce associated with constructing the Heap Leach Pad and Ore Processing Facility is not expected to contribute to net labor migration into the Study Area. However, because construction of the Congo Pit would be conducted by mining personnel and construction of the Sheep Underground Mine would span 18 months, with many of the construction workers transitioning to the mine's operational workforce, migration patterns for the Congo Pit and Sheep Underground Mine construction workforces are expected to be more characteristic of an operational workforce, which includes non-local employees who relocate to their place of employment. The non-local portions of the Construction workforces for the Congo Pit and Sheep Underground Mine and the Operations workforces for all Project components are expected to contribute to net labor migration in the Study Area. The non-local workforce associated with Reclamation would include workers with specialized skills who would work in the Study Area on a short-term basis, and not relocate.

Based on expected non-local workforce levels, net labor migration is estimated to include approximately 107 workers between Project Years 1 and 5 (see Table 4.4-4). Dependents often accompany migrating workers. Based on the 2012 average Wyoming household size of 2.52 and average Wyoming family size of 3.04 (Census Bureau, 2013b), population growth associated with net labor migration due to the Proposed Action is projected to add between 269 and 325 residents to the Study Area during the Project's first 5 years. These estimated population impacts may overstate actual changes in the Study Area's population by the extent to which non-local workers would relocate to surrounding counties (Natrona County, for example) rather than the Study Area, and the extent to which some relocating workers would not be accompanied by dependents.

Table 4.4-4
Proposed Action with On-Site Processing:
Potential Population Change in the Study Area

Population Measure	Project Year 1	Project Year 4	Project Year 5	Total
Net Labor Migration into the Study Area				
Congo Pit	20	--	--	20
Sheep Underground Mine	--	25	39	64
Heap Leach Pad/Ore Processing Facility	23	--	--	23
Total relocating workers	43	25	39	107
Projected Population Growth in the Study Area				
Based on household size (2.52)	108	63	98	269
Based on family size (3.04)	130	76	119	325

Potential population growth resulting from the Proposed Action with on-site processing is not expected to affect long-term population trends in Fremont and Carbon counties because project-driven growth would be within the range of growth that that has occurred in both counties over the past several years. Between 2000 and 2013, Fremont County added an average of 435 new residents per year, and Carbon County added an average of 23 new residents per year. Annual population gains expected from the Proposed Action are less than 1 percent of the 2013 populations in either Fremont or Carbon counties.

The distribution of population growth across the Study Area would be determined by several factors, including distance from the Project Area, the availability (and affordability) of housing, proximity to community facilities and services, and local cultural factors distinct to each surrounding community. Based on these considerations, the historic residency patterns of mining and other industrial workers in Fremont County and informed judgment, this analysis assumed that 60 percent of migrating Project workers would relocate to Riverton, 20 percent would relocate to Lander, and 20 percent would relocate to Rawlins. As shown in Table 4.4-5, the estimated Project-driven growth in each municipality is within the range of recent population gains. This, as well as the scale of the estimated population changes relative to current population levels, indicates that Project-related population growth would not impact long-term population trends in Riverton, Lander, or Rawlins.

Table 4.4-5
Proposed Action with On-Site Processing:
Estimated Project-Related Population Growth in Riverton, Lander and Rawlins

Area	Estimated Project-Related Population Growth			Average Annual Population Growth, 2000 – 2013	2013 Population
	Project Year 1	Project Year 4	Project Year 5		
Fremont County					
Riverton[1]	65 - 78	38 - 46	59 - 71	128	10,969
Lander[2]	22 - 26	13 - 15	20 - 24	67	7,736
Carbon County					
Rawlins[3]	22 - 26	13 - 15	20 - 24	22	9,291

[1] Assumes that 60 percent of migrating Project workers relocate to Riverton.
[2] Assumes that 20 percent of migrating Project workers relocate to Lander.
[3] Assumes that 20 percent of migrating Project workers relocate to Rawlins.

To the extent that some workers may relocate to rural areas and small communities closer to the Project Area, including Jeffrey City and Sweetwater Station, Table 4.4-5 overestimates municipal population growth. Although Project-driven growth would not be likely to impact population trends in Riverton, Lander, or Rawlins, population trends in smaller communities could be affected if sufficient numbers of Project workers chose to relocate there.

Project completion could lead to out-migration in Fremont and Carbon counties in the event that former Project workers would be unable to secure alternative employment in the Study Area. Given the Study Area's extensive mineral resource base and a growing regional economy, it is likely that any population losses due to Project completion would be offset by job creation in other businesses within the Study Area.

Boom and Bust Characteristics
Based on the scale of potential population changes in Riverton, Lander, and Rawlins relative to current population levels, Project-driven population growth is not likely to contribute to boom-bust development patterns in these towns. Jeffrey City and Sweetwater Station could be impacted if sufficient numbers of migrating Project workers relocated to these areas and, upon Project completion, were unable to find suitable work in the local area and out-migrated.

Housing
Short-term Housing. The Construction workforce for the Heap Leach Pad and Ore Processing Facility would rotate due to different trades required at different times of the Construction phase, and non-local construction workers would be likely to stay in short-term housing accommodations in the Study Area. Because mining personnel are expected to develop the Congo Pit and Sheep Underground Mine, construction of the mining facilities is not expected to place additional demands on short-term housing in the Study Area. During construction of the Heap Leach Pad and Ore Processing Facility, as many as 77 non-local construction workers could require short term housing. This demand represents approximately 4 percent of the hotel and motel rooms, and approximately 3 percent of the combined hotel and motel rooms and RV sites in Riverton, Lander, Rawlins, and Jeffrey City. Consequently, the Proposed Action with on-site processing is not expected to have a significant indirect impact on the Study Area's short-term housing markets.

Although the Proposed Action is expected to have minimal impacts on short-term housing markets in Fremont and Carbon counties, localized impacts could occur. To the extent that peak Project-related demand coincided with peaks in summer tourism, there could be upward pricing pressure on motel room rental rates in some areas. This would be likely to result in workers seeking accommodations in other towns or other facilities, such as RV parks.

Long-term Housing. The demand for housing units by relocating Operations workers (including workers constructing the Congo Pit and Sheep Underground Mine) would begin with the start of mining and ore processing near the end of Project Year 1. The absorption of approximately 107 new households between Project Years 1 and 5 is not expected to have adverse indirect impacts on housing markets in the Study Area. As discussed in Section 3.4.4.4, the WHDP estimates that Fremont County will require housing to accommodate between 654 and 867 new households, and that Carbon County will require housing to accommodate 103 new households, between 2015 and 2020.

Applying the average 2010 home ownership rate of 72 percent in Fremont and Carbon counties to relocating households, during the Project's first 5 years approximately 77 relocating households would purchase homes and approximately 30 new households would rent. Historic vacancy rates in Fremont and Carbon counties and anecdotal evidence suggest that, in the short-term, it may be easier for migrating workers to find rental housing in Rawlins than in Riverton or Lander (see Table 3.4-8 in Chapter 3).

Short-term indirect impacts to housing markets associated with the Proposed Action with on-site processing could include increased housing costs (residential sale prices and rental rates) in some areas. Low income households in Riverton, Lander, and Rawlins may find it more difficult to secure affordable housing. In the long-term, housing markets respond to an increased demand for housing through new construction. Accordingly, long-term indirect impacts to housing associated with on-site processing could include a stimulated residential construction market.

Reclamation could have indirect depressive impacts on local housing markets through the potential out-migration of previously-employed Project workers. However, the potential decrease in the demand for housing associated with such out-migration is expected to be limited given the size of the Project's workforce relative to the size of each community's housing market.

Community Services and Public Infrastructure

Schools. Because construction workers are not typically accompanied by dependents, construction of the Heap Leach Pad and Ore Processing Facility would not be likely to affect school enrollments in the Study Area. Based on household composition and family size in Wyoming, school age children estimated to accompany the Project's 107 migrating workers would include 26 students in Project Year 1, 16 students in Project Year 4, and 24 students in Project Year 5. These estimates overstate Project-related school enrollments to the extent that some migrating workers would not be accompanied by dependents.

Based on expected labor migration patterns, the majority of new enrollments would be in Fremont School District 25, which is the largest school district in the Study Area. New enrollments would be the highest in Project Year 1, when school enrollments would increase by 16 students in Fremont School District 25, five students in Fremont School District 1, and five students in Carbon School District 1 (see Table 4.4-6). The new students would likely be enrolled in different schools and grades in each school district. Current enrollments in these school districts are comparable to or lower than they have been in recent years, indicating the ability to absorb new students that could result from relocating households. Therefore, the Proposed Action with on-site processing is expected to have minimal indirect impacts on local educational facilities and staffing levels.

Table 4.4-6
Proposed Action with On-Site Processing:
Estimated Change in School District Enrollments

School District	Project Year 1	Project Year 4	Project Year 5	Total
Fremont School District 25[1]	16	10	14	40
Fremont School District 1[2]	5	3	5	13
Carbon School District 1[3]	5	3	5	13
Total new enrollments	26	16	24	66

[1] Assumes that 60 percent of migrating workers relocate to Riverton.
[3] Assumes that 20 percent of migrating workers relocate to Lander.
[4] Assumes that 20 percent of migrating workers relocate to Rawlins.

In the event of population out-migration due to Project completion, school enrollments in the Study Area could decrease.

Medical Services. Locally hired construction workers for construction of the Heap Leach Pad and Ore Processing Facility are assumed to be currently using health care services within the Study Area, and would not generate incremental demand for medical services. As non-local construction workers would be in the area temporarily, most of these workers would only seek emergency and urgent health care while working on the Heap Leach Pad and Ore Processing Facility. Non-local construction workers would not have relationships with physicians in the Study Area, and would be likely to use urgent care clinics and emergency rooms at hospitals in Riverton, Lander, or Rawlins for urgent, but non-emergency, medical needs. Because the non-local construction workforce is estimated to peak at 77 workers, non-local construction worker demand for health care services is not expected to result in adverse indirect impacts to health care providers in the Study Area.

Energy Fuels would prepare an Emergency Response Plan outlining procedures for handling on-site accidents and emergencies. Following this, as well as safe mining practices and BMPs, is expected to limit the need for medical services due to on-site accidents. The incremental demand for medical services due to mining and processing in the Project Area is expected to be within the capacity of current health care service providers, as well as service providers who may relocate to the Study Area during the period in which the Project is implemented.

The additional demand for health care services associated with Project-driven population growth is also expected to be within the capacity of current health care service providers, as well as service providers who may relocate to the study over the Project's life. Project closure is not expected to have adverse indirect impacts on health care or medical service providers in the Study Area.

Public Safety and Emergency Services. Construction and Operations have the potential to affect local law enforcement agencies by requiring the Fremont and Carbon county sheriff's offices; the Riverton, Lander, and Rawlins police departments; and the Wyoming Highway Patrol to provide traffic management and accident response services to workers commuting to and from the Project Area, and to vehicles hauling material, equipment and supplies to the site. During the 9 months of Heap Leach Pad and Ore Processing Facility construction, local law-enforcement officials could face an increase in traffic- and alcohol-related offenses committed by construction workers during their off-hours. Thus, construction of the Heap Leach Pad and Ore Processing Facility could have a short-term indirect impact on local law enforcement.

During Construction and Operations, the JCVFD would provide first-call emergency services to the Project Area. The handling of emergencies in the Project Area would follow Energy Fuels' Emergency Response Plan. On-site fire management systems in the Ore Processing Facility would include a firewater loop with hydrants and hose reels, sprinkler systems and fire extinguishers. In the absence of owner-provided on-site emergency equipment and emergency response personnel, Construction and Operations with on-site processing could place additional demands for emergency response services on the JCVFD that would result in indirect adverse impacts to the volunteer fire force.

Project-driven population growth could also increase demands on local law enforcement agencies and fire and emergency service providers. Given the expected level of population growth in any particular area, indirect impacts on local law enforcement agencies and emergency responders due to Project-related population growth are expected to be minimal. Project completion and any associated population losses are not expected to have adverse indirect impacts on public safety and emergency service providers in the Study Area.

Fiscal Conditions

Fiscal impacts associated with the Proposed Action would include mineral severance taxes, property taxes, and sales and use taxes. Severance tax revenues would be based on the assessed value of Project production and would be a direct impact of the Proposed Action. Property tax revenues would be based on the assessed values of Project production and facilities, and would also be a direct impact of the Proposed Action. Sales and use tax revenues from the Project's taxable expenditures would be a direct impact of the Proposed Action, and sales tax revenue from households' spending of income derived from the Project on taxable expenditures would be an indirect impact.

Under the Proposed Action, estimated annual production would range from a low of 388,000 pounds of uranium in the early years of Operations to a high of 1,736,000 pounds during peak production years (BRS Engineering, 2012). The annual average over 16 years of Operations would be 1,148,000 pounds of uranium. The tax revenues that are estimated to be associated with this production and discussed below do not imply that the Project would generate these levels of tax revenue each year.

Mineral Severance Taxes. Based on the Project's anticipated production rates, costs to mine the uranium ore, total production costs, and a final product price of $65 per pound, Energy Fuels estimates that severance tax revenue from the Proposed Action would average $1,153,750 per year over a 16 year production period (BRS Engineering, 2012). Applying severance tax distributions between FY 2005 and FY 2013, annual distributions from the Project would approximate $446,017 to the Permanent Wyoming Mineral Trust Fund; $329,031 to the Budget Reserve Account; $288,571 to the General Fund; and $90,131 to other state entities, including water development agencies, highway and county roads, and cities.

Property Taxes. Under the Proposed Action, Fremont County would receive annual property tax revenues based on the value of uranium production and the assessed value of facilities and equipment in the Project Area. Energy Fuels estimates that property taxes from the Proposed Action would average $2,186,500 per year over 16 years of production (BRS Engineering, 2012). Based on 2013 mill levies for the public entities with ad valorem taxing authority in Tax District 149 (where the Project Area is located), approximately 55 percent of property tax revenues ($1,204,537) would fund public education, 29 percent ($632,510) would fund Fremont County government, 10 percent ($215,048) would fund the Jeffrey City Water and Sewer District, 4 percent ($80,643) would fund the Jeffrey City Fire District, 1 percent ($26,881) would fund the Popo Agie Conservation District, and 1 percent ($26,881) would fund recreation districts. Direct fiscal impacts to Fremont County due to property tax revenues would vary annually based on the level of production, the price of uranium, Project costs, local taxing rates (mill levies), and the depreciation of facilities and equipment.

Sales and Use Tax. Estimated Project expenditures and household spending were used to estimate sales and use tax revenues associated with the Proposed Action with on-site processing. The analysis applied several assumptions, all of which were intended to produce conservative revenue estimates. Based on industry averages, 40 percent of Energy Fuels' non-labor expenditures were assumed to be subject to sales or use tax. Sales tax revenues from household spending were estimated by adjusting the IMPLAN model's estimated total labor income to exclude benefits and tax liabilities. Nationally, benefits account for 29.7 percent of income (BLS, 2014c). Federal income taxes and social security insurance were estimated to account for 12 percent of income minus benefits (Peter G. Peterson Foundation, 2014). The resulting estimate of disposable income was further adjusted to consider spending on taxable items only. Nationally, 39.7 percent of household income is spent on housing and health care, which are not taxable (BLS, 2014d). Therefore, the sales tax revenues associated with household spending estimated in this analysis applied to 60.3 percent of the IMPLAN model's estimated disposable income.

The analysis assumed that all taxable Project expenditures would either be purchased in Fremont County and subject to Fremont County sales tax, or purchased outside the county and subject to Fremont County use tax at the point of purchase. Regarding household spending, the analysis assumed that 80 percent of taxable household spending would take place in the Study Area, with the remainder being spent in other counties. Based on estimated labor migration patterns, the analysis assumed that 80 percent of household spending within the Study Area would occur in Fremont County and that 20 percent of household spending within the Study Area would occur in Carbon County.

Taxable purchases made in Fremont County are subject to a 4 percent state tax rate and 1 percent General Purpose County Option Tax Rate. Taxable purchases made in Carbon County are subject to a 4 percent state tax rate, 1 percent General Purpose County Option Tax Rate, and 1 percent Specific Purpose County Option Tax Rate (Wyoming Department of Revenue, 2013). Based on the assumptions described above and current tax rates, annual sales tax revenue to the State of Wyoming would average $447,145 per year, sales and use tax revenue to Fremont County would average $102,751 per year, and sales tax revenue to Carbon County would average $8,031 per year over the life of the Project.

4.4.4.1.2 Impacts with Off-Site Processing

Table 4.4-7 summarizes the proposed workforce levels in the Project Area with off-site processing as discussed in Section 2.3.7. Local workers are expected to comprise approximately half of the Construction, Operations and Reclamation workforces for the Congo Pit and Sheep Underground Mine, and all ore haul truck drivers.

Table 4.4-7
Sheep Mountain Construction, Operations and Reclamation
Workforce Requirements in the Project Area

Project Component	Duration	Number of Workers		
		Local	Non-Local	Total
Construction				
Congo Pit	2 – 4 months	10	10	20
Sheep Underground Mine	18 months	25	25	50
Operations				
Congo Pit	8 years	21	20	41
Sheep Underground Mine	11 years	64	64	128
Ore Haul Truck Drivers[1]	Years 1 - 4	7	0	7
Ore Haul Truck Drivers[2]	Years 5 - 16	15	0	15
Reclamation Phase				
Congo Pit	5 years	12	12	24
Sheep Underground Mine	1 – 2 years	3	3	6

[1] Based on ore production from the Congo Pit only.
[2] Based on ore production from the Congo Pit and Sheep Underground Mine.

Figure 4.4-2 shows the estimated workforce levels in the Project Area with off-site processing.

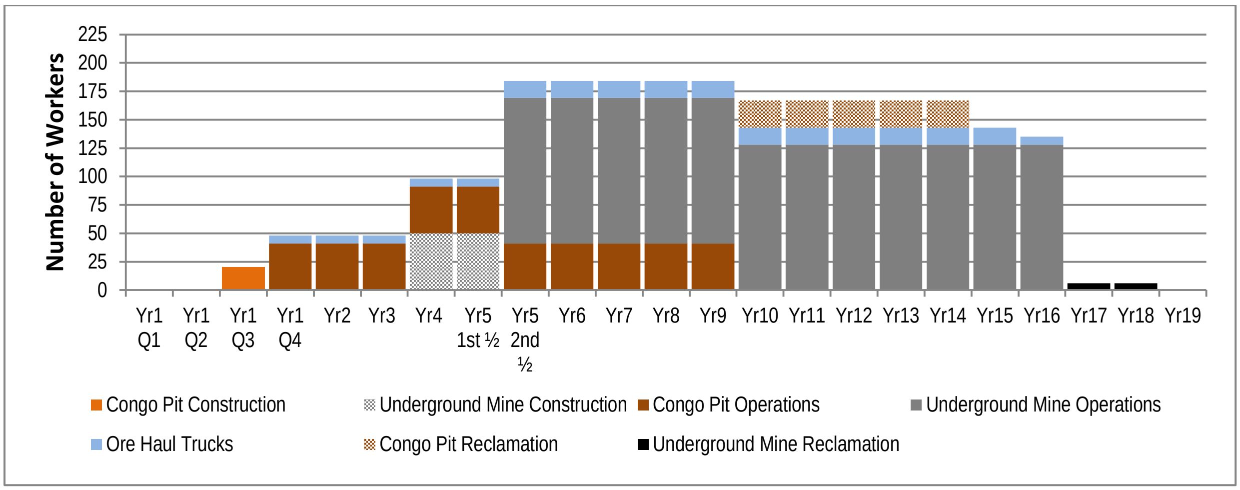


Figure 4.4-2
Proposed Action with Off-Site Processing: Estimated Workforce in the Project Area

In addition to the Project workers employed in the Project Area, Energy Fuels estimates that construction and refurbishment of the Sweetwater Mill would require approximately 55 construction workers over 6 months and that approximately 120 workers would be employed during mill operations. Although this section identifies the potential socioeconomic impacts associated with processing ore off-site, the current analysis focuses on evaluating the potential impacts of employment in the Project Area (mining personnel and ore haul truck drivers) on socioeconomic conditions in the Study Area.

Employment and Income

With off-site processing, direct Project employment and spending associated with mining in the Project Area would be key determinants of the Project's socioeconomic impacts, including secondary employment and income effects and regional economic growth. The methodology for converting workforce estimates to annual jobs is discussed above in Section 4.4.4.1.1.

During Project Year 1, when the Congo Pit would be constructed and Operations begin, direct Project employment would include 17 jobs. Energy Fuels would spend approximately $1.3 million in the Study Area in Year 1, including approximately $1.1 million on labor expenditures. Project and worker spending would support approximately five indirect and induced jobs in the Study Area; labor income associated with this employment would approximate $162,096. Output in the Study Area would expand by approximately $618,370 during Year 1 of the Proposed Action with off-site processing (see Table 4.4-8).

Table 4.4-8
Proposed Action with Off-Site Processing:
Average Annual Economic Impacts to the Study Area[1,2]

Impact Measure	Project Year 1	Project Years 2 – 3	Project Years 4 - 5	Project Years 6 - 16	Project Years 17 - 18
Employment[3]					
Direct	17	48	117	168	6
Indirect	1	2	6	6	2
Induced	4	9	11	16	1
Total	23	59	134	190	9
Labor Income					
Direct[4]	$1,077,984	$2,363,165	$2,984,323	$4,660,840	$269,885
Indirect	$27,548	$107,227	$246,923	$291,515	$97,113
Induced	$134,548	$294,112	$376,466	$528,368	$45,520
Total	$1,240,080	$2,764,504	$3,607,712	$5,480,723	$412,518
Value Added					
Direct	$276,624	$1,811,424	$1,618,573	$3,700,276	$581,652
Indirect	$53,658	$208,792	$424,098	$577,207	$174,370
Induced	$288,088	$629,736	$806,124	$1,131,307	$97,461
Total	$618,370	$2,649,952	$2,848,795	$5,408,790	$853,483
Output					
Direct[5]	$1,264,242	$5,030,098	$7,263,446	$15,073,941	$1,388,163
Indirect	$95,920	$377,061	$768,760	$1,061,774	$318,131
Induced	$455,547	$995,784	$1,274,694	$1,788,902	$154,110
Total	$1,815,709	$6,402,943	$9,306,900	$17,924,617	$1,860,404

[1] Source: IMPLAN v.3.1 data for 2012: Fremont and Carbon counties.
[2] Based on employment, labor income and Project expenditures associated with Construction, Operations, and Reclamation in the Project Area. Does not include employment, labor income and expenditures associated with off-site processing.
[3] Total annual average jobs, including all full-time, part-time and seasonal jobs. Total annual jobs equals the number of workers employed during a year multiplied by the portion of the year they are employed.
[4] Based on annual labor expenditures reported in BRS Engineering, 2012.
[5] Based on annual expenditures reported in BRS Engineering, 2012.

During Project Years 2 and 3, when the Congo Pit would be operating and ore would be hauled to the Sweetwater Mill for processing, direct Project employment would include 48 jobs per year. Energy Fuels would spend approximately $5 million in the Study Area each year, including $2.4 million on annual labor expenditures. Project and worker spending would support approximately 11 indirect and induced jobs in the Study Area each year; annual labor income associated with this employment would average $401,338. Output in the Study Area would expand by an average of $2.65 million annually during Years 2 and 3 of the Proposed Action with off-site processing.

Between Project Years 4 and 5, when the Congo Pit would be operating, ore would be hauled to the Sweetwater Mill, and the Sheep Mountain Mine would be under construction, direct Project employment would include an average of 117 jobs per year. On average, Energy Fuels would spend approximately $7.3 million in the Study Area each year, including approximately $3 million on annual labor expenditures. Project and worker spending would support approximately 16 indirect and induced jobs in the Study Area each year; annual labor income associated with this employment would average $623,448. Output in the Study Area would expand by an average of $2.85 million annually during Years 4 and 5 of the Proposed Action with off-site processing.

During Operations in Project Years 6 through 16, direct Project employment would include an average of 168 jobs per year. On average, Energy Fuels would spend approximately $15.1 million in the Study Area each year, including $4.7 million on annual labor expenditures. Project and worker spending would support approximately 22 indirect and induced jobs in the Study Area each year; annual labor income associated with this employment would average $819,883. During this time, output in the Study Area would expand by an average of $5.4 million annually.

During Reclamation of the Sheep Underground Mine in Project Years 17 and 18, direct Project employment would include six jobs per year. Energy Fuels would spend approximately $1.4 million in the Study Area each year, including approximately $269,885 on annual labor expenditures. Project and worker spending would support approximately three indirect and induced jobs in the Study Area each year; annual labor income associated with this employment would average $142,633 per year. During this time, output in the Study Area would expand by approximately $853,483 annually.

Project employment and spending associated with Construction, Operations, and Reclamation of the Sweetwater Mill would generate additional indirect and induced employment and income impacts. Although estimating the economic impacts of spending at the Sweetwater Mill is beyond the scope of the current analysis, most of these effects would be likely to occur in Sweetwater and Carbon counties.

Population

Mining in the Project Area is expected to attract workers from across Wyoming and neighboring states. Under the Proposed Action with off-site processing, net labor migration into the Study Area would occur periodically between Project Years 1 and 5. Based on average household and family sizes in Wyoming, population growth associated with Project-driven labor migration is projected to add between 211 and 256 residents to the Study Area over 5 years (see Table 4.4-9). These estimated population impacts may overstate actual changes in the Study Area's population by the extent to which dependents would not accompany some relocating workers, and some non-local workers would relocate to surrounding counties rather than the Study Area.

Potential population growth associated with mining in the Project Area would be within the range of growth that has occurred in the Study Area over the past several years and is not expected to impact population trends in Fremont and Carbon counties. Assuming that 60 percent of relocating mining personnel would settle in Riverton, 20 percent would settle in Lander, and 20 percent would settle in Rawlins, the estimated Project-driven growth in each municipality is within the range of recent population gains.

Table 4.4-9
Proposed Action with Off-Site Processing:
Potential Population Change in the Study Area[1]

Population Measure	Project Year 1	Project Year 4	Project Year 5	Total
Net Labor Migration into the Study Area				
Congo Pit	20	--	--	20
Sheep Underground Mine	--	25	39	64
Total relocating workers	20	25	39	84
Projected Population Growth in the Study Area				
Based on household size (2.52)	50	63	98	211
Based on family size (3.04)	61	76	119	256
Project-Related Population Growth in Study Area Towns				
Riverton[2]	30 - 36	38- 46	59 - 71	127 - 153
Lander[3]	10 - 12	13 - 15	20 - 24	42 - 51
Rawlins[4]	10 - 12	13 - 15	20 - 24	42 - 51

[1] Based on Project workers in the Project Area only.
[2] Assumes that 60 percent of migrating Project workers relocate to Riverton.
[3] Assumes that 20 percent of migrating Project workers relocate to Lander.
[4] Assumes that 20 percent of migrating Project workers relocate to Rawlins.

Population change could also result from labor in-migration at the Sweetwater Mill. Energy Fuels' estimation that non-local workers would comprise approximately 70 percent of the Sweetwater Mill's operational workforce would result in the immigration of approximately 84 workers in Project Year 1. Based on average household and family sizes in Wyoming, and the assumption that dependents would accompany all relocating workers, population growth could include between 212 and 255 new residents. Estimating population distribution associated with labor migration at the Sweetwater Mill is beyond the scope of the current analysis. However, most relocating workers would be likely to settle in the communities closest to the mill, including Bairoil, Wamsutter, and Rawlins. Population growth associated with migrating mill workers would not be likely to affect population trends in Rawlins, but could affect the smaller communities of Bairoil and Wamsutter if sufficient numbers of mill workers chose to relocate to those towns.

Reclamation of the Congo Pit and Sheep Underground Mine could lead to out-migration in Fremont and Carbon counties if former Project workers were unable to secure alternative employment in the Study Area. Similarly, closure of the Sweetwater Mill could result in out-migration in Sweetwater and Carbon counties. Regional economic growth would be likely to offset any population losses at the county level, and it is not likely that the populations of Riverton, Lander, or Rawlins would be noticeably impacted by Project closure. In the absence of other local economic activities, noticeable out-migration of population due to Project closure would be expected in Bairoil, Jeffrey City, Sweetwater Station, and Wamsutter.

Boom and Bust Characteristics
Based on the scale of potential population change relative to current population levels, Project-driven population growth is not likely to contribute to boom-bust development patterns in Riverton, Lander, or Rawlins. Small communities close to the Project Area (Jeffrey City and Sweetwater Station) and the Sweetwater Mill (Bairoil and Wamsutter) could be affected if sufficient numbers of migrating workers relocated to these areas over the life of the Proposed Action and out-migrate upon Project completion.

Housing

Short-term Housing. Construction in the Project Area is expected to result in negligible incremental demand for short-term housing in the Study Area. Energy Fuels expects that approximately 70 percent of the temporary workforce required to construct and refurbish the Sweetwater Mill would consist of non-local workers. Accordingly, approximately 39 construction workers at the Sweetwater Mill would require short-term housing. Based on the availability of short-term housing accommodations, most of these workers would be expected to stay in Rawlins. The potential demand for short-term housing by the mill's construction workforce represents approximately 5 percent of the motel rooms in Rawlins and approximately 4 percent of the motel rooms and RV sites in Rawlins. Consequently, the Proposed Action is not expected to have a significant indirect impact on short-term housing markets in the Study Area.

Long-term housing. Labor in-migration due to mining in the Project Area is expected to result in the demand for 85 additional housing units between Project Years 1 and 5. Most workers in the Project Area would be likely to seek long-term housing resources in Riverton, Lander, and Rawlins. Applying the average 2010 homeownership rate of 72 percent in Fremont and Carbon counties to relocating households, during the first 5 years of project implementation, approximately 61 relocating households would purchase homes and 24 new households would rent.

Labor in-migration due to uranium processing at the Sweetwater Mill is expected to result in the demand for 84 additional housing units during the first year of project implementation. Most operational workers at the mill would be likely to seek long-term housing resources in communities closest to the mill. Applying the average 2010 homeownership rate of 72 percent in Sweetwater and Carbon counties to relocating households, approximately 60 relocating households would purchase homes and 24 new households would rent.

The demand for housing by workers in the Project Area and at the Sweetwater Mill could stimulate Rawlins' housing market. Additional short-term indirect impacts to local housing markets may include increased housing costs (residential sale prices and rental rates), which would make it more difficult for low-income households to secure affordable housing. Long-term indirect impacts associated with the Proposed Action could include stimulated residential construction markets in communities near the Project Area and the Sweetwater Mill.

Community Services and Public Infrastructure

Schools. With off-site processing, potential indirect impacts to Fremont school districts #1 and #25 due to Project-driven population growth would be comparable to impacts under the Proposed Action with on-site processing. Indirect impacts to Carbon School District #1 could be more noticeable as Rawlins may attract in-migrating households associated with both the Project Area and the Sweetwater Mill. In addition, Carbon School District #1 would be impacted by new households relocating in eastern Sweetwater County as students from Bairoil and Wamsutter are bussed to Rawlins for junior and high school, and elementary school students in Bairoil are currently bussed to Sinclair Elementary School.

Medical Services. Non-local construction workers at the Sweetwater Mill would be likely to use the Wamsutter Community Health Center or urgent care clinics and Memorial Hospital in Rawlins for urgent, but non-emergency, medical needs. Because the non-local construction workforce at the Sweetwater Mill is estimated to peak at 39 workers, the demand for health care services by non-local construction workers is not expected to adversely affect regional health care providers. During Project operations, emergency response plans would be in place in the Project Area and at the Sweetwater Mill that would limit the need for medical services due to accidents at either location. The incremental demand for medical services likely to be associated with mining in the Project Area and uranium processing at the Sweetwater Mill is expected to be within the capacity of current health care providers, as well as providers who may relocate to the Study Area during the period in which the Project is implemented.

With off-site processing, potential impacts to medical service providers in Fremont County due to Project-driven population growth would be comparable to impacts under the Proposed Action with on-site processing. Due in large part to the lack of medical services in eastern Sweetwater County, Project-driven population growth associated with mining in the Project Area and processing at the Sweetwater Mill could combine to impact medical service providers in Rawlins. Project closure is not expected to have adverse indirect impacts on health care or medical service providers.

Public Safety and Emergency Services. Construction and Operations in the Project Area and at the Sweetwater Mill could impact local law enforcement agencies by requiring the Fremont, Carbon, and Sweetwater county sheriff's offices; the Riverton, Lander, and Rawlins police departments; and the Wyoming Highway Patrol to provide traffic management and accident response services to workers commuting to and from the Project Area and Sweetwater Mill, and to vehicles hauling material, equipment, and supplies to both sites. Construction and refurbishment of the Sweetwater Mill could place additional demands on local law enforcement officials due to an increase in traffic- and alcohol-related offenses committed by construction workers during their off-hours.

Although emergency response plans would be in place at both locations, mining in the Project Area could place additional demands for emergency response services on the JCVFD and uranium processing at the Sweetwater Mill could place additional demands for emergency response services on the Wamsutter VFD. In the absence of owner-provided on-site emergency equipment and emergency response personnel, construction and operation of the Proposed Action with off-site processing are expected to result in indirect impacts to the Jeffrey City and Wamsutter VFDs.

Project-driven population growth could also increase demands on local law enforcement agencies and fire and emergency services. Indirect impacts on local law enforcement agencies and emergency responders in Fremont County due to incremental population growth are expected to be minimal. Indirect impacts on local law enforcement agencies and emergency responders in Carbon and eastern Sweetwater counties due to incremental population growth could be more substantial, especially in Bairoil, which currently has no local fire department (Urbatsch, 2014). Project closure and any associated population losses are not expected to have adverse indirect impacts on public safety and emergency service providers in the region.

Fiscal Impacts

Severance Taxes. Because severance taxes are not specific to the location of the severed material, the estimated severance tax revenues that would be paid under the Proposed Action with off-site processing would be unchanged from the severance tax revenues that would be paid under the Proposed Action with on-site processing.

Property Taxes. Under the Proposed Action with off-site processing, Fremont County would receive property tax revenue based on uranium production and the assessed value of facilities and equipment in the Project Area, and Sweetwater County would receive property tax revenue based on the assessed value of facilities and equipment at the Sweetwater Mill. Because production would account for the vast majority of property tax revenue, overall, property tax revenue to Fremont County would decrease slightly from the average $2,186,500 per year estimated by Energy Fuels as production would account for the vast majority of property tax revenue.

Sales taxes. Applying the same assumptions as those used to estimate sales tax revenue under the Proposed Action with on-site processing, annual sales tax revenue to the State of Wyoming would average $353,085 per year, sales and use tax revenue to Fremont County would average $82,182 per year, and sales tax revenue to Carbon County would average $6,766 per year over the life of the Project. Additional sales tax revenue would accrue from Project spending at the Sweetwater Mill and from households' spending of income derived from the mill. Although estimating sales tax revenue associated with the Sweetwater Mill is beyond the scope of the current analysis, much of the mill's spending and the spending of households supported by the mill would be likely to occur in Carbon and Sweetwater counties, thereby providing additional sales tax revenues to these two counties.

4.4.4.1.3 Monitoring and/or Compliance

No monitoring and/or compliance measures are required for Socioeconomics.

4.4.4.2 <u>BLM Mitigation Alternative</u>

4.4.4.2.1 Impacts

Potential direct and indirect impacts to Socioeconomics under the BLM Mitigation Alternative would be unchanged from those for the Proposed Action. To ensure that health, safety, and community service needs are addressed, Energy Fuels would maintain active and open communication with governmental entities throughout the life of the Project (SE-1 in Table 2.4-1).

4.4.4.2.2 Monitoring and/or Compliance

No monitoring and/or compliance for socioeconomics would be required under the BLM Mitigation Alternative.

4.4.4.3 <u>No Action Alternative</u>

Under the No Action Alternative, surface and underground mining and ore processing would not occur in the Project Area or at the Sweetwater Mill, and there would be no change to current socioeconomic conditions and trends in the Study Area. There would be no Project-driven labor migration or population change, and no increased demand for housing and community services by relocating households. There would be no demand for emergency response services at the Project Area or the Sweetwater Mill due to Project activity. There would be no severance tax revenues to the State of Wyoming or property tax revenues to Fremont County from uranium production, and no Project-related sales tax revenues to the state and counties. Energy Fuels would continue to pay approximately $1,079 in annual property taxes for the Sheep Mountain property.

4.4.5 Environmental Justice

EO 12898 requires that every federal agency "shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority population and low-income populations." The EPA has lead responsibility for implementation of the EO. The EPA recommends a screening process to identify environmental justice concerns that addresses the following issues:

- Potential presence of minority and/or low-income populations in the affected community; and

- Likelihood that the environmental impacts will fall disproportionately on minority and/or low-income members of the community and/or a tribal resource.

If the screening process indicates that there is a potential for environmental justice effects, the EPA recommends that the following factors be considered in the analysis:

- Potential for a disproportionate risk of high and adverse human health or environmental effects;
- Sufficient involvement of potentially affected communities in the decision-making process; and
- Extent to which affected communities currently suffer, or have historically suffered, from environmental and health risks and hazards (EPA, 1998).

The potential for Environmental Justice impacts were evaluated using the CEQ's "meaningfully greater" criterion population analysis in which minority and low-income populations in the Study Area (Fremont and Carbon counties) and communities surrounding the Project Area (the Jeffrey City Census County Division) were compared to state-wide reference populations (CEQ, 1997). Minority and low-income populations equal to or greater than 120 percent of the state-wide relevant population were considered to be "meaningfully greater" populations. This criterion level was selected because it is commonly used for NEPA compliance by federal agencies. Minority and low-income populations identified as "meaningfully greater" were evaluated for potential effects that could disproportionately impact any such populations.

4.4.5.1 <u>Proposed Action Alternative</u>

4.4.5.1.1 Impacts with On-Site Processing

"Meaningfully greater" minority populations in the Study Area include Native American and low-income populations in Fremont County (21.1 percent and 15.2 percent, respectively, of the county's population) and Hispanic populations in Carbon County (16.7 percent of the county's population). Most of Fremont County's Native American population lives on the Wind River Indian Reservation. The nearest reservation boundary is approximately 60 miles northwest of the Project Area. The portion of Fremont County where the Project Area is located (the Jeffrey City Census County Division) is sparsely populated, with a total of 92 residents spread across 1,964 square miles (Census Bureau, 2013a). According to the Census Bureau's 2012 ACS, the Jeffrey City Census County Division contains no minority populations. Statewide, minority populations account for 8.8 percent, and Hispanic populations account for 8.9 percent of the total population. Therefore, the potential direct environmental effects of the Proposed Action would not be expected to disproportionately affect minority or low-income populations.

Indirect effects that could occur at a greater distance from the Project Area, such as air quality, housing, or traffic effects, would affect the study area's population equitably, without regard to race or ethnicity. For example, Project-related traffic would be heaviest on Crooks Gap/Wamsutter Road, between Jeffrey City and the Project Area, where few residents live. Trucks hauling yellowcake for further processing would travel on US Highway 287/WY 789 through eastern Fremont County and western Carbon County to access Interstate-80, but would add only a very small increment to the existing traffic volumes on these highways. Native American populations in Fremont County and Hispanic populations in Carbon County are not expected to be disproportionately affected by Construction or Operation of the Proposed Action with on-site processing. Although the increased demand for housing by Project workers could make it difficult for low-income populations in Fremont County to find affordable housing, the direct, indirect and induced jobs associated with the Proposed Action would create additional job opportunities for some low-income individuals.

Regarding whether communities have been sufficiently involved in the decision-making process, the BLM held three public scoping meetings and distributed public notices about the Sheep Mountain Uranium Project through mailings and notices in area newspapers and formal notice in the Federal Register (see Section 1.4.1). In addition, the BLM toured the Project Area with tribal representatives in order to elicit comments about the Sheep Mountain Project and potential sites of religious or cultural significance (see Section 4.4.3).

4.4.5.1.2 Impacts with Off-Site Processing

If Sheep Mountain ore is processed off-site, the direct impacts to Environmental Justice in the Study Area would be unchanged from those evaluated with on-site processing. Indirect impacts related to increased truck traffic on Crooks Gap/Wamsutter Road and Minerals Exploration Road, between the Project Area and the Sweetwater Mill would affect the Study Area's population equitably, without regard to race or ethnicity. The potential indirect housing impacts on low-income populations in Fremont County are likely to be partially offset by increased job opportunities created by the Proposed Action.

The NRC has jurisdiction over processing uranium into U_3O_8 or yellowcake, and the BLM's authority is limited to determining whether the approach to uranium mining and reclamation selected by Energy Fuels would result in undue or unnecessary degradation of public surface. Therefore, within the current document, the Study Area in which to evaluate potential impacts to Environmental Justice was not expanded to include Sweetwater County.

4.4.5.1.3 Monitoring and/or Compliance

No monitoring and/or compliance measures are required for Environmental Justice.

4.4.5.2 BLM Mitigation Alternative

4.4.5.2.1 Impacts

Potential direct and indirect impacts to Environmental Justice under the BLM Mitigation Alternative would be unchanged from those for the Proposed Action.

4.4.5.2.2 Monitoring and/or Compliance

No monitoring and/or compliance measures are required for Environmental Justice.

4.4.5.3 No Action Alternative

Neither the Proposed Action nor the BLM Mitigation Alternative would occur under the No Action Alternative, and there would be no impacts to Environmental Justice caused by Energy Fuels' on-going reclamation obligations.

4.4.6 Transportation/Access

Potential issues associated with transportation/access were identified by the BLM through the public scoping process, as well as internal scoping. Issues include:

- Increased on- and off-road traffic; and
- Construction of new roads and modifications to existing roads.

Direct impacts to transportation were evaluated by comparing estimates of Project-related traffic with traffic levels on state highways reported by the WYDOT. Existing traffic levels on county roads that would be used to access the Project Area were not available. Due to the lack of comparable data, indirect impacts to road maintenance and vehicle crashes were assessed qualitatively. Indirect impacts to highway fatalities were evaluated by comparing estimated project-related vehicle miles with historic fatality rates reported by the NHTSA.

Assumptions used to analyze impacts to transportation and access include:

- project traffic would use the access routes described in the Sheep Mountain Transportation Plan (Appendix 2-A) and summarized in Section 3.4.6.1;
- the majority of project traffic is expected to originate in Riverton, Lander, and Rawlins. A few vehicles could also travel to the Project Area from Casper;
- heavy vehicles required for Construction, Operations, and Reclamation of the Congo Pit and Sheep Underground Mine would remain on-site;
- over the road vehicles would comply with all applicable USDOT, WYDOT, and MSHA rules and regulations;
- all use of Fremont, Carbon, and Sweetwater county roads would be conducted in accordance with county regulations; and
- all roads in the Project Area would be constructed to design specifications contained in BLM Manual 9113 (BLM, 2011c).

4.4.6.1 Proposed Action Alternative

4.4.6.1.1 Impacts with On-Site Processing

Based on the estimated vehicle round-trips discussed in Section 2.3.8 and the Project's development schedule summarized in Section 2.3.6, Figure 4.4-3 shows the estimated number of vehicle round-trips per day during each year of the Project's life, assuming that ore is processed on-site. During construction of the Heap Leach Pad/Ore Processing Facility and Congo Pit in Year 1, Project traffic would include between 61 and 71 vehicle round-trips per day. Traffic in Years 2 and 3 would include approximately 42 vehicle round-trips per day associated with operation of the Congo Pit and Heap Leach Pad/Ore Processing Facility. Project traffic would increase to approximately 67 vehicle round-trips per day in Year 4, when the Sheep Underground Mine would be under construction. Traffic levels would be highest between Years 5 and 9, when the Congo Pit, Sheep Underground Mine, and Heap Leach Pad/Ore Processing Facility would all be operating. Traffic would begin to decrease with closure of the Congo Pit in Year 10, would decrease further upon completion of Reclamation at the Congo Pit in Year 16, and would decrease again with Reclamation of the Sheep Underground Mine and Heap Leach Pad/Ore Processing Facility in Year 17. Traffic during the final three years of the Project's scheduled life would include approximately 27 vehicle round-trips per day associated with Reclamation of the Sheep Underground Mine and Heap Leach Pad/Ore Processing Facility.

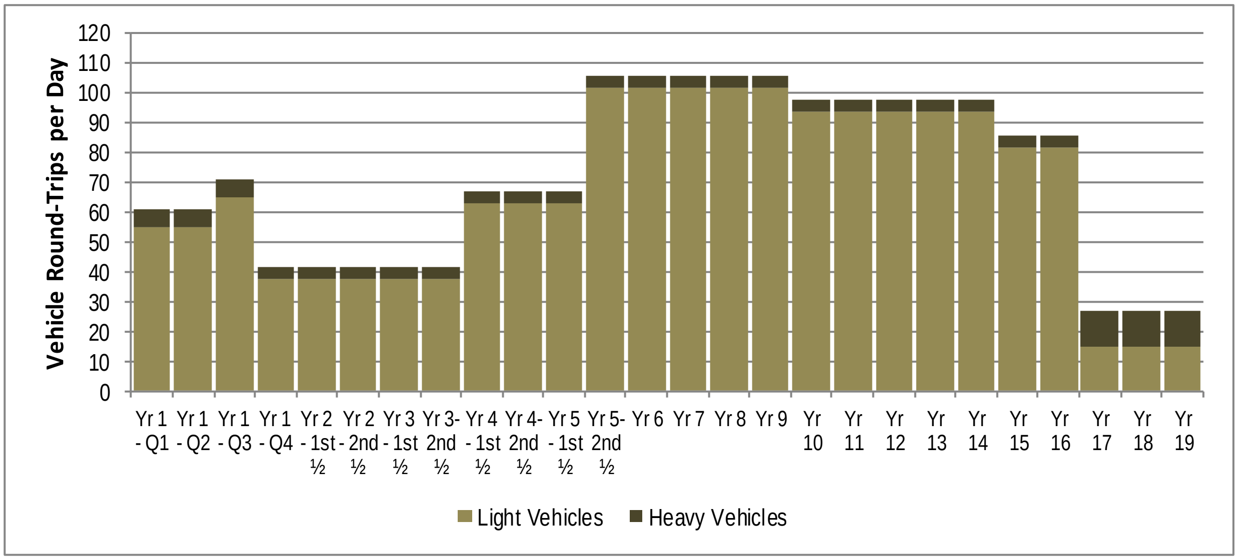


Figure 4.4-3
Peak Vehicle Round-Trips per Day with On-Site Processing

These Project-related vehicle round-trips would result in direct impacts to transportation through additional vehicle trips on affected roadways. Direct impacts would peak between Years 5 and 9. Based on the assumption that 70 percent of Project-related traffic would originate in Lander and Riverton, 25 percent would originate in Rawlins, and 5 percent would originate in Casper, peak Project traffic would result in the following traffic increases on state highways compared to 2011 traffic levels:

- a 2 percent increase in traffic on US Highway 287/WY 789 between Rawlins and Jeffrey City;
- a 6.5 percent increase in traffic on US Highway 287/WY 789 between Lander and Jeffrey City;
- a 15 percent increase in traffic on WY 135 between Sweetwater Station and WY 136;
- a 67 percent increase in traffic on WY 136 between WY 135 and WY 789 south of Riverton;
- a 1 percent increase in traffic on WY 789 between Riverton and WY 136; and
- less than a 1 percent increase in traffic on WY 220 between Muddy Gap and Casper.

Although increased traffic volumes would be noticeable on WY 135 and WY 136, they are not expected to exceed the capacity of any state highway. The 67 percent increase in traffic on WY 136 is high, in part, because current traffic levels are so low; WYDOT reports a 2011 AADT of 222 on WY 136 (WYDOT, 2012a). Traffic impacts between Years 1 and 4 would be 40 to 60 percent of peak impacts. Traffic impacts between Years 10 and 16 would be 80 to 90 percent of peak impacts. Traffic impacts in Years 17 through 19 would be 25 percent of peak impacts.

Project traffic would result in a sizeable increase in traffic on Crooks Gap/Wamsutter Road between Jeffrey City and the Project Area. Traffic counts for Crooks Gap/Wamsutter Road are not available for comparison, but Project-related vehicles would result in a noticeable increase in traffic on Crooks Gap/Wamsutter Road between Jeffrey City and the Project Area throughout Construction, Operations, and Reclamation.

Indirect impacts would include increased road deterioration and a consequent increase in maintenance requirements on roads affected by traffic increases, increased vehicular noise, increased dust on unpaved roads, and increased opportunities for vehicular crashes. Dust suppression would be implemented by spraying water on unpaved roads on an as-needed basis. Energy Fuels would coordinate the maintenance of county roads with Fremont and Sweetwater counties based on county road use, improvement, and maintenance agreements that would be put into effect prior to the start of mining, and would be responsible for all maintenance actions necessary to provide all weather access to the Project Area. Energy Fuels' county road use, improvement, and maintenance agreements with the counties would include provisions addressing the repair of existing roads due to damages caused by Construction, Operations, and Reclamation traffic. Energy Fuels would maintain on-site roads in accordance with BLM 9113 Manual specifications. Maintenance would include, but not be limited to dust abatement; reconstruction of the crown, slope, and/or water bars; blading or resurfacing; material application; clean-out of ditches, culverts, and catchments; snow plowing; and other BMPs.

Peak traffic would result in an estimated 643,124 Project-related miles traveled on state highways each year. Based on a fatal accident rate of 1.57 fatalities per hundred million vehicle miles traveled on rural roads in Wyoming, this could result in an additional 0.01 highway fatalities each year, or 1 highway fatality every 100 years (NHTSA, 2014). Resource-specific impacts associated with the use of existing roads and the construction of new roads in the Project Area are discussed in others sections of this chapter.

4.4.6.1.2 Impacts with Off-Site Processing

Based on estimated vehicle round-trips for mining personnel and trucks hauling uranium ore to the Sweetwater Mill (see Section 2.3.8), Figure 4.4-4 shows the estimated vehicle round-trips per day during each year of the Project's scheduled life, assuming that ore is processed off-site.

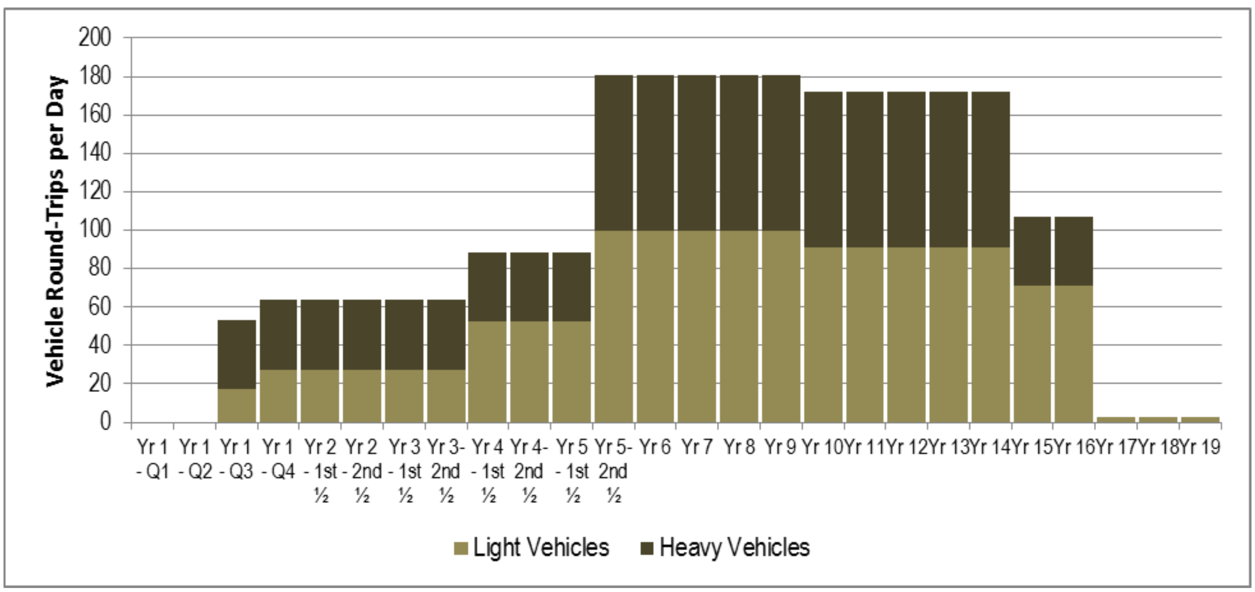


Figure 4.4-4
Peak Vehicle Round-Trips per Day with Off-Site Processing

Between Project years 1 and 3, Project traffic would include Congo Pit worker vehicles and ore haul trucks, and would range from approximately 53 to 64 vehicle round-trips per day. Traffic would increase to approximately 89 vehicle round-trips per day in years 4 and 5, when construction traffic for the Sheep Underground Mine would add to the Congo Pit's operational traffic and ore haul traffic. This analysis assumes that 35 truckloads of ore per day (approximately half of the maximum potential ore haul traffic) would be hauled to the Sweetwater Mill with only the Congo Pit in operation.

With the Sheep Underground Mine in operation, Project traffic would peak at 181 vehicles per day between late Year 5 and Year 9. Traffic would decrease to 172 vehicle round-trips per day between years 10 and 14, when Reclamation traffic for the Congo Pit would join Operations traffic at the Sheep Underground Mine and ore haul trucks (the analysis assumes that 80 truckloads of ore per day would be hauled to the Sweetwater Mill with both the surface and underground mines producing). Upon completion of the reclamation of the Congo Pit, Project traffic would fall to approximately 107 vehicle round-trips per day, which would include operational traffic for the Sheep Underground Mine and approximately 35 ore haul trips per day (assuming decreasing mine productivity). Traffic during the final 3 years of Project life would include approximately three vehicle round-trips per day associated with reclamation of the Sheep Underground Mine.

The direct impacts of Project-related vehicle trips on affected roads would be greatest with the Congo Pit and Sheep Underground Mine in operation and ore from both mines being transported to the Sweetwater Mill (Years 5 to 9). The Project-related traffic with off-site processing would include ore haul trucks that would not travel on state highways. Assuming that 70 percent of the Project's highway traffic would originate in Lander and Riverton, 25 percent of the highway traffic would originate in Rawlins, and 5 percent of the highway traffic would originate in Casper, peak Project traffic would result in the following traffic increases on state highways compared to 2011 traffic levels:

- a 2 percent increase in traffic on US Highway 287/WY 789 between Rawlins and Jeffrey City;
- a 6 percent increase in traffic on US Highway 287/WY 789 between Lander and Jeffrey City;
- a 14 percent increase in traffic on WY 135 between Sweetwater Station and WY 136;
- a 63 percent increase in traffic on WY 136 between WY 135 and WY 789 south of Riverton;
- a 1 percent increase in traffic on WY 789 between Riverton and WY 136; and
- less than a 1 percent increase in traffic on WY 220 between Muddy Gap and Casper.

Between Years 1 and 3, traffic impacts would be approximately 35 percent of peak impacts. Traffic impacts in Years 4 and 5 would be approximately 50 percent of peak impacts. Traffic impacts between Years 10 and 16 would be 60 to 95 percent of peak impacts. Traffic impacts during between Years 17 and 19 would be approximately 2 percent of peak impacts.

Project vehicles would result in a notable increase in traffic on Crooks Gap/Wamsutter Road between Jeffrey City and the Project Area. Ore haul trucks would lead to even greater traffic increases on Crooks Gap/Wamsutter Road and the western-most 3 miles of Minerals Exploration Road between the Project Area and Sweetwater Mill. Project traffic on these roads would remain high throughout mining operations in the Project Area.

Indirect impacts under this alternative would be similar to those under the Proposed Action with on-site processing, and would include increased road deterioration and an increase in maintenance requirements on roads affected by traffic increases, increased vehicular noise, increased dust on unpaved roads, and increased opportunities for vehicular crashes. Measures implemented by Energy Fuels to minimize these impacts would be similar to those described above for the Proposed Action with on-site processing. If ore is processed at the Sweetwater Mill, Energy Fuels would comply with Sweetwater County road use, improvement, and maintenance agreements and BLM roadway maintenance agreements in coordination with the Sweetwater Mill.

Peak traffic would result in an estimated 606,395 Project-related highway miles each year. Based on a fatal accident rate of 1.57 fatalities per hundred million vehicle miles traveled on rural roads in Wyoming, this could result in an additional 0.0095 highway fatalities each year, or 1 highway fatality every 106 years (NHTSA, 2014).

4.4.6.1.3 Monitoring and/or Compliance

No monitoring and/or compliance measures would be required for transportation and access.

4.4.6.2 BLM Mitigation Alternative

4.4.6.2.1 Impacts

The BLM Mitigation Alternative would use the same mining and ore processing procedures over the same timeframe as the Proposed Action Alternative. Under the BLM Mitigation Alternative, if on-site processing occurs, Energy Fuels would be required to identify and reclaim or enhance the reclamation of a portion of ground within the Project Area equal to the area to be removed from the public domain and transferred to the State of Wyoming or the DOE (TRA-1 in Table 2.4-1). Energy Fuels would be required to obtain agreements with appropriate county transportation departments or other road owners for which use is proposed. In particular, if off-site processing were to occur, agreements with appropriate counties would be required for hauling along the Crooks Gap/Wamsutter Road (TRA-2 in Table 2.4-1).

Under the BLM Mitigation Alternative, the direct impacts of additional vehicle trips associated with Construction, Operations, and Reclamation would be unchanged from those described for the Proposed Action. Indirect impacts, including increased road deterioration and an increase in maintenance requirements on roads affected by traffic increases, increased vehicular noise, increased dust on unpaved roads, increased opportunities for vehicular crashes, and additional increases in traffic to the Sweetwater Mill related to mill employees and deliveries would also be unchanged from the Proposed Action. Additional indirect impacts under the BLM Mitigation Alternative would include enhanced post-reclamation recreational opportunities, improved public safety, increased productivity of reclaimed areas through the restoration of natural conditions, improved wildlife habitat through enhanced revegetation, and decreased soil erosion, sedimentation, and habitat fragmentation.

In their comment letter on the Preliminary Draft EIS dated February 23, 2015 Sweetwater County summarized the additional maintenance requirements that would be required to accommodate Project traffic:

- Crooks Gap/Wamsutter Road (4-23) – In order to utilize the upper Crooks Gap/Wamsutter Road as a haul road for the 70 to 80 heavy vehicle trips per day, additional road improvements and maintenance requirements, beyond what are currently being implemented by Sweetwater County and UR Energy, may be required. If this road is to be utilized as a haul road to the Sweetwater Mill, Sweetwater County may require a road use, improvement and maintenance agreement prior to project commencement.
- Minerals Exploration Road (4-63) – Within Sweetwater County, major improvements to the pavement of the Minerals Exploration Road would be required to utilize it for the

traffic levels as projected. If Minerals Exploration Road is to be utilized as a haul road in conjunction with the Sweetwater Mill, Sweetwater County may require a road use, improvement and maintenance agreement prior to the commencement of the Project.

- Bairoil Road (4-22) - Sweetwater County recommends against utilizing this road for Project purposes unless a significant capital investment is made to improve its condition for future maintenance.

4.4.6.2.2 Monitoring and/or Compliance

No monitoring and/or compliance measures would be required for transportation and access.

4.4.6.3 No Action Alternative

Under the No Action Alternative, mining and ore processing would not occur at the Sheep Mountain Project Area and ore processing would not occur at the Sweetwater Mill. There are approximately 6.5 miles of existing roads in the Project Area that connect previously constructed components of the Project. Under the No Action Alternative, some of these roads would be reclaimed due to current obligations under existing permits including the Project Access Road to the Sheep Declines Shop and McIntosh Pit up to the Sheep II Shaft, and Hanks Draw Road up to the Sheep I Shaft.

4.4.7 Public Health and Safety

The primary issues associated with public health and safety were identified by the BLM through internal scoping, consultation with cooperating agencies, and through comments provided during the scoping process, and include the following:

- health impacts from current radiological levels within the Project Area and from any increase to those levels from the Proposed Action;
- disclosure of the types and amounts of hazardous materials to be used and the types and amounts of solid and radioactive waste that would be generated;
- storage of hazardous materials, measures for spill containment, and protection of soil and groundwater; and
- likelihood of a transportation-related release of hazardous or radioactive materials and the potential impacts of such a release.

4.4.7.1 Proposed Action Alternative

4.4.7.1.1 Impacts with On-Site Processing

The BLM recognizes the NRC's expertise in, and jurisdiction over, the control and proper use of radiological materials, and therefore the analysis presented herein discloses impacts over which the BLM has no jurisdiction in regulating.

Impacts to public health and safety were identified using the following assumptions:

- enclosed buildings would be sufficiently ventilated to protect workers from excessive radon exposure;
- radioactivity of any solid waste generated by Construction or Operations would be low-level and disposal methods identified in Section 2.3.10, Waste Management, would be sufficient; and
- the transportation, storage, use, and disposal of hazardous materials for mine operations would continue for the life of the mine (approximately 20 years).

Exposure to Radioactive Materials

The short-lived decay products of radon-222 gas are the primary radioactive constituents of concern in a uranium mine. These "radon daughters" can accumulate in an enclosed space, and result in a potential increased risk of cancer. The EPA indicates that indoor radon gas may be responsible for 21,000 deaths in the U.S. per year (EPA, 2013c). As provided in the Uranium Leasing Program Final Programmatic EA (DOE, 2007), EPA evaluated exposures from radon emissions for individuals located near uranium mines (EPA, 1989). For underground uranium mines, radon concentrations for nearby individuals (within 0.33 to 33 miles) ranged from 2.0 x 10^{-6} to 0.0031 working levels (EPA, 1989). Assuming that an individual was continuously exposed, this is equivalent to a probability of a latent cancer fatality of 5.5 x 10^{-8} to 8.5 x 10^{-5}, or about 5 chances in 100 million to 8 chances in 100,000. Over 10 years, the probability of a latent cancer fatality would range from 5.5 x 10^{-7} to 8.5 x 10^{-4}, or about 5 chances in 10 million to 8 chances in 10,000. For perspective, an individual has a lifetime probability of dying of cancer from all sources of about 220,000 in 1 million, or a risk of lung cancer of 60,000 in 1 million.

Regardless of the setting, whether residential or industrial, radon gas emissions are typically mitigated by external venting. The radon ventilated from the mine would quickly disperse upon reaching exhaust shafts or portals. The EPA would require monitoring of radon gas from mine vents as per 40 CFR § 61, subpart B, which would result in an annual assessment of incremental radon exposure to nearby residents. Because of the Project Area's remote location, no impacts to the general public are predicted. However, the EPA will further evaluate impacts from vent shafts during their permitting process to satisfy 40 CFR § 61 subpart B, and determine appropriate protection measures if warranted.

Dose estimates at receptor locations at the boundary of the mining operation were calculated using the MILDOS-AREA model (see Appendix B in the AQTSD – Appendix 4-A). In addition to releases of radon from mine sources, including underground mine adits, radio-particulates resulting from transport of ore, grinding, and conveyance to the processing site were modeled. A location adjacent to the Hanks Draw Spoils Facility had the highest modeled total effective dose equivalent (TEDE) of 19.7 mrem/yr. The same location had an estimated dose to the bone of 29.3 mrem/yr without radon daughter products. The bone dose is slightly in excess of the 40 CFR § 190 25 mrem/yr for any organ, or to the whole body or 75 mrem/yr to the thyroid. It is important to note that the calculated doses are conservative (overestimates). MILDOS assumes 100 percent occupancy at the modeled location. In order to receive 19.7 mrem TEDE at the Hanks Draw Spoils Facility, a person would be required to be at that location for 8,760 hours during the year. Realistically, a person would only be there for a few hours annually. Likewise, the calculated bone dose of 29.3 mrem is an overestimate for the same reason.

Potential doses to members of the public were calculated for both mining and ore processing (see Table 4.4-10). The locations that were modeled were common to both mine and ore processing facilities.

Table 4.4-10
Modeled TEDE Doses from Mining and Ore Processing

Name	TEDE (mrem/yr)		
	Mine	**Mill**	**Total**
Claytor Ranch	7.76	0.927	8.69
Landfill Transfer	2.15	0.715	2.87
Jeffrey City	6.99	0.169	7.16
Maximum NRC – mine max (NRC5/NLA-NE)	12.9	2.23	15.1
Maximum NRC - processing max (NRC3/NLA-N1)	84.3	18.0	102.3

The nearest residence, the Claytor Ranch location, was estimated to receive a total of approximately 8.7 mrem from the combined mine and ore processing and less than 4 mrem/yr to bone, exclusive of radon exposure. The majority of the estimated dose would result from mining, which is reasonable given the locations of the mine and the ore processing facilities. The same is true for Jeffrey City, which would receive a total of 7.2 mrem/yr.

The doses calculated by MILDOS do not take into account those that might be received from existing background. Data shown in Table 3-14 of Appendix 3-A provide a basis to estimate doses from background radio-particulates. Applying the dose conversion factors from Federal Guidance Report #11 (EPA, 1988), assuming standard breathing rate and 100 percent occupancy for an adult to the average concentrations at the list air monitoring stations, a TEDE of approximately 18 mrem is calculated.

To provide a more realistic assessment of a potential dose to a member of the public based on an assumed exposure timeframe, doses were estimated for four different categories: courier, tour group, landfill worker, and camper. The estimated dose to each of those categories under certain scenarios was less than 1 mrem/yr in all cases (see Table 4.4-11).

Table 4.4-11
Potential Classes of Exposure to Members of the Public

Class	Annual Hours Exposed	Estimated Annual Dose [1]
Delivery Person	2.5 hr/wk * 50 wks/yr = 125 hr/yr	(125 hr/yr * 4.63 mrem/yr)/8,760 hr/yr = 0.066 mrem/yr
Tour Group	8 hr/yr	(8 hr/yr * 12.2 mrem/yr)/8,760 hr/yr = 0.011 mrem/yr
Landfill Worker	8 hr/wk * 50 wk/yr = 400 hr/yr	(400 hr/yr * 2.15 mrem/yr)/8,760 hr/yr = 0.098 mrem/yr
Camper [2]	1 wk/yr = 168 hr/yr	(168 hr/yr * 19.7 mrem/yr)/8,760 hr/yr = 0.38 mrem/yr

Source: MILDOS Report (see Appendix B in the AQTSD – Appendix 4-A).
[1] Doses were based on the modeled locations shown in Appendix B of the AQTSD (Appendix 4-A).
[2] Campers are not anticipated to be present due to limited access during Operations and lack of roads after Reclamation. However, hunters, who might camp, have been known to use the area, so for a conservative assessment, exposure during Operations was assessed. Exposure would be less after Reclamation.

Radon releases from the underground mine would be from the Sheep I and Sheep II shafts. Releases were modeled as point sources, resulting in a maximum estimate of 5.58 mrem/yr (see Appendix B in the AQTSD - Appendix 4-A for modeling locations). Using an average wind speed of 12.9 mph (5.8 m/sec) and the same release rate as modeled by MILDOS, the EPA COMPLY model calculated a dose to the nearest receptor, Claytor Ranch, or 2.55 mrem. The 40 CFR § 61.22 regulation limits the dose to a member of the public from an underground mine to 10 mrem/yr. As above, the modeled doses are subject to the assumption of 100 percent occupancy at the modeled location, which is a large overestimate even for a residence.

No detailed analysis of radio-particulate emissions from the Congo Pit was performed using modelling. Experience with open pit mines in Washington and California has shown there is no appreciable release of radio-particulates from the pit that would be accessible to members of the public (Little, 2015). The Congo Pit is several hundred feet deep. That coupled with the assumption that water spray is going to be used during mining operations, led to the assumption that no particulates would be released from the pit that would impact the public. Additionally, the

BLM must assume for this analysis that the requirements of the WDEQ-AQD air permit are met and particulate matter emissions are acceptable or are acceptable with conditions of approval from the Congo Pit as a result of this permit (through dust control and other measures). If particulate emissions are acceptable, then impacts as a result of radio-particulates would also be acceptable because there is no separate standard for radio-particulate emissions.

Workers are protected through MSHA regulations, as well as the Wyoming State Mine Inspector's Office, which establishes maximum exposure levels of radon and radon-daughter products. Between 1985 and 1989, the average occupational radiation dose for uranium miners in the United States was 350 mrem/yr (United Nations Committee on the Effects of Atomic Radiation - UNSCEAR, 2000). This radiation dose is equivalent to a probability of a latent cancer fatality of 2.1×10^{-4}, or about 2 chances in 10,000. Over 10 years, the probability of a latent cancer fatality would be 2.1×10^{-3}, or about 2 chances in 1,000. A radon-daughter monitoring program would be established in accordance with 57 CFR § 5037, in which exposure levels would be monitored and recorded. If radiation levels in a working area were found to be in excess of MSHA standards, the ventilation would be corrected immediately and more frequent monitoring would be required to verify compliance.

For the Heap Leach Pad, under NRC regulations (10 CFR § 20), workers would be limited to an annual radiation exposure limit of 5,000 mrem/year. In modern mills, the annual total effective dose equivalent (above background) received by a mill worker is typically on the order of 200 to 300 mrem with a maximum of approximately 700 mrem/yr, for normal working conditions. Of course, the dose would vary considerably by ore grade and job duties (Little, 2014). The maximum exposure limit set by the NRC (10 CFR § 20.1301) for the general public at the Property Boundary and beyond is 100 mrem/yr above background. Adherence to this limit is verified through sampling and monitoring. Exposure at the nearest residence is expected to be 10 mrem/year or less. The exposure limits for mill workers and the general public have been set by regulatory agencies based on input from health professionals and numerous health studies. Energy Fuels must maintain radiation levels below these regulatory limits.

The uranium ore and recycled materials such as scrap metal, batteries, and tires are the only radioactive materials that could be trucked from the site and potentially affect the general public. USDOT regulations require that the ore trucks be tarped and checked for radiation levels prior to leaving the mine site and the mill site on the return leg. In the event of an accident resulting in an ore spill, the spilled material and surrounding area would be cleaned up to background levels. Cleanup levels would be verified using a gamma meter or similar instrument. Energy Fuels' company policies require that all scrap metal and other recyclables be checked with an appropriate meter prior to leaving the mine site. If radiation levels were found to be elevated, the material would be cleaned using a power wash or other methods to meet appropriate radiation standards.

While no specific numeric standards for mine reclamation with respect to surficial radiological concentrations exist, Energy Fuels has proposed to employ the guidance developed by the WDEQ-AML for future mining and reclamation activities. Current WDEQ-AML practice is to reclaim mine lands for unrestricted use based on an assessment of radiological health risks. Based on the findings of Hersloff et al. (1988), the WDEQ-AML employs a surface clean up criteria of 20 pCi/g radium-226. For the Proposed Action, a near surface soils/overburden concentration of 20 pCi/g radium-226 would equate to approximately 70 μR/hr. Where local conditions and such factors as availability of cover and topsoil affect the ability to meet this goal, principals of ALARA ("as low as (is) reasonably achievable") would be employed. ALARA means making every reasonable effort to maintain exposures to ionizing radiation as low as practical. This approach was undertaken by WDEQ-AML with respect to mine reclamation projects within the Project Area, including the Paydirt Pit (west of the Congo Pit) and Sun Heald (east of the proposed Ore Processing Facility) areas. The Paydirt Pit reclamation resulted in surface gamma levels of 75 μR/hr or less. At Sun Heald, the reclaimed surface exhibits higher gamma levels.

As part of the NRC's reclamation requirements, Energy Fuels would be required to survey areas surrounding the Heap Leach Pad for radiological contamination (i.e., windblown material from the Heap Leach Pad) and, as needed, remove contaminated soils to an NRC-approved disposal location (most likely in the reclaimed pad).

Section 2.3.4.2 notes the procedures which would be used during Operations and Reclamation for grade control to meet the proposed mine reclamation goal of 20 pCi/g radium-226 (equating to approximately 70 μR/hr). When implemented, this procedure would reduce existing surface gamma levels in areas such as the Congo Pit from current levels, which are well in excess of 70 μR/hr, to an acceptable range of 70 μR/hr or lower.

<u>Wastes, Hazardous or Solid</u>

Given the combination of waste management mitigation and controls to be utilized on-site (see Section 2.3.10), there should be no impacts associated with hazardous and solid wastes at the site. Impacts that may occur would be the result of incidental spills. Spill response measures are outlined in the Spill Contingency Plan and therefore, the overall impact attributable to this source would be minimal.

Solid Waste. Waste containers for organic materials (from lunchroom, etc.) would be provided. Non-hazardous materials would be recycled or disposed of off-site at a licensed facility. The only waste material that would be buried on-site would consist of the demolition debris generated during reclamation. Therefore, effects associated with solid waste would not occur or would be those allowed under the applicable laws and regulations.

Hazardous Waste (Non-Radioactive). All hazardous waste would be disposed of or recycled in accordance with state regulations and, in some cases, landfill-specific requirements. Therefore effects would not occur or would be those allowed under the applicable laws and regulations.

Radioactive Waste. As described previously, the NRC is the lead regulatory agency with jurisdiction to oversee use and disposal of radiological materials, such as uranium, and would regulate wastes from the Project. Again, BLM recognizes the NRC's expertise in, and jurisdiction over, the control and proper use of radiological materials.

Response to an Accidental Release. Response to all spills of hazardous materials would be implemented according to a Spill Plan and would ensure any spills that occur during transportation and loading/unloading on-site would be cleaned up as soon as possible. Spills exceeding the reportable quantity would be reported to the NRC, WDEQ, EPA, National Response Center, BLM, and the county Emergency Response Coordinator. Releases occurring en-route to or from the Project would be the responsibility of the transportation company. Law enforcement and fire protection agencies also could be involved to initially secure a spill site and protect public safety. Hazardous material transporters are required to maintain an emergency response plan which details the appropriate response, treatment, and cleanup for a material spilled onto land or into water.

For on-site spills, the procedures outlined in the Spill Plan would be used to contain chemicals and fluids used for the Project operations. Specific procedures would be developed for other hazardous materials stored and used at the mine. Any cleanup would be followed by appropriate restoration of the disturbed area, which could include replacing removed soil, seeding the area to prevent erosion, and returning the land to its previous use.

Potential Effects of an Accidental Release. Depending on the material released, the amount released, and the location of the release, an accident resulting in a release could affect soils, water, biological resources, and human health. The remediation of spills, whether non-radioactive hazardous material or radioactive material, would be under the jurisdiction of the NRC, WDEQ, and EPA; cleanup would be conducted in compliance with those agencies' rules to be protective of human health and the environment.

Waste Transportation. All hazardous or radioactive waste generated by the Project would be transported to licensed disposal facilities in accordance with applicable federal and state regulations. Non-radioactive solid wastes would be disposed of appropriately depending upon waste type. The risk of transportation of radioactive waste would be low and the same emergency management procedures would apply.

Non-radioactive hazardous materials would be transported by commercial carriers or vendors in accordance with the requirements of Title 49 of the CFR. Carriers would be licensed and inspected as required by the WYDOT and USDOT. Permits, licenses, and certificates would be the responsibility of the carrier. Title 49, Parts 71 and 171-180, of the CFR requires that all shipments of hazardous substances be properly identified and placarded. Shipping papers must be accessible and must include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, firefighting information, procedures for handling leaks or spills, first aid measures, and emergency response telephone numbers.

4.4.7.1.2 Impacts with Off-Site Processing

Carriers involved with the transportation of radioactive materials between the Project Area and the Sweetwater Mill would comply with USDOT rules regarding Hazard Category 7 (radioactive material). In the event of an accident involving a truck trailer with uranium-laden material or chemicals, Energy Fuels would implement response procedures that would include a course of action for responding to a transportation spill, preparedness requirements for transporters, and notification procedures. Energy Fuels would also be prepared to assist with transportation-related emergency responses through a cleanup contractor that would be on 24-hour call.

In the event of a trucking accident with the release of potentially hazardous materials, proper implementation of a response plan would minimize exposure to the public, emergency response personnel, and workers. Following an Incident Command Structure, Energy Fuels and its contractors would notify appropriate agencies and emergency response personnel and would respond, monitor, and clean the affected site until the site was considered acceptable. For some types of spills, cleanup criteria are established by agencies and would be met before Energy Fuels' responsibility would end. Consequently, the hazard posed by trucking of the radioactive material and hazardous chemicals poses minimal risks to public health or to the environment. Additionally, WYDOT would respond immediately to hazardous materials accidents to minimize the spread of contaminants. If Energy Fuels did not respond, WYDOT would contract emergency cleanup services and relay the cost to the hauling contractor.

Impacts associated with off-site processing would be the same as those described above for on-site processing. Any additional impact to public health and safety at the Sweetwater Mill is not anticipated considering the mill currently exists and is a licensed facility with the NRC, required to meet the regulatory radiation exposure limits described under on-site processing. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analyses as necessary.

4.4.7.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.4.7.2 BLM Mitigation Alternative

4.4.7.2.1 Impacts

Impacts to public health and safety under the BLM Mitigation Alternative would be similar to those under the Proposed Action Alternative.

4.4.7.2.2 Monitoring and/or Compliance

Monitoring under the BLM Mitigation Alternative would be the same as that described above for the Proposed Action Alternative.

4.4.7.3 No Action Alternative

Under the No Action Alternative, land use and surface-disturbing activities would continue as currently authorized. Because the Project as proposed is entirely within an active mine permit, Energy Fuels is obligated to complete certain reclamation efforts under the existing WDEQ-LQD Permit to Mine 381C that would occur under the No Action Alternative and WDEQ-AML Project 16-O would also occur. Existing radon levels would remain the same or be decreased through the required reclamation, and waste management would remain the same.

4.5 LAND RESOURCES

4.5.1 Recreation

Potential issues associated with impacts to recreation were identified by the BLM through the public scoping process and public comment on the Draft EIS. Issues include:

- Reduction and user conflict in dispersed recreation activities such as hunting and OHV use;
- Potential effects on recreation activities at Western Nuclear Pond;
- Reduction in the naturalness of the recreation setting; and
- Hazards posed to recreational use of the area due to increased Project-related traffic.

4.5.1.1 Proposed Action Alternative

4.5.1.1.1 Impacts with On-Site Processing

Current and potential recreational activities in the Project Area and vicinity include hunting, fishing, and OHV use. Big game hunting and fishing have historically been allowed on BLM and private lands within and surrounding the Project Area where access is available, and the lands are still actively used for these purposes. The area would continue to be used for hunting throughout all phases of the Project; however, hunting would not be allowed in areas of active mining for safety reasons, and access would be limited.

Direct impacts to recreational users would occur through removal or restriction of areas currently used for hunting within the Project Area. No developed recreational facilities or sites would be affected. Because of historical uranium mining in the area and the presence of more attractive regional recreational opportunities, the Project Area and vicinity is not highly sought after for its recreational resources.

Indirect effects would be associated with Construction, Operations, and Reclamation of surface infrastructure (Congo Pit, spoils facilities, Ore Pad, Ore Processing Facility, Conveyor, topsoil stockpiles, building and parking, power lines) resulting in a more urbanized setting. Increased traffic on area roads and noise from traffic and mining and ore processing would be indirect impacts during all phases of the Project.

The increased development of the area would result in reduced naturalness although the setting is already highly modified due to historical uranium mining. Hunting and OHV use could be affected by alteration of existing travel patterns for vehicles and wildlife during all phases of the Project. Surface disturbing activities may remove or reduce wildlife habitat, which could displace big game.

Existing roads would be upgraded and new roads would be constructed; however, some of these may be within areas that would be fenced off or closed to recreational users. In areas where roads are closed, but not fenced, motorized access would be reduced but the area would be enhanced for non-motorized hunters.

Fishing at Western Nuclear Pond would continue under the Proposed Action. As discussed in Section 2.5, improvements to Western Nuclear Pond are being conducted under the WDEQ-AML Project 16-O. Access to the area would not be blocked and area roads would remain open. Visitors to the area could encounter increased traffic, dust, and noise levels due to the Proposed Action. Overall, impacts to recreational users would be expected to be minor due to acclimation to historical uranium development in the Project Area and vicinity.

4.5.1.1.2 Impacts with Off-Site Processing

If off-site processing occurs, truck traffic between the Project Area and the Sweetwater Mill would increase the opportunity for wildlife-vehicle collisions and would also increase noise and dust. These effects to recreational users would be minimized because the increased traffic would only occur on the existing Crooks Gap/Wamsutter Road. Although the generally low volume traffic setting would be altered, overall impacts to recreational users are expected to be minimal.

Any additional impact to recreation at the Sweetwater Mill is not anticipated considering the mill currently exists. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analyses as necessary.

4.5.1.1.3 Monitoring and/or Compliance

No monitoring or compliance would be associated with recreation resources.

4.5.1.2 BLM Mitigation Alternative

4.5.1.2.1 Impacts

The BLM Mitigation Alternative includes the same surface disturbing activities and impacts discussed for the Proposed Action above; however, impacts to recreational users could be less under this alternative. Roads and reclamation could be planned with hunters and recreationists in mind, creating opportunities for them where possible. Energy Fuels would be required to inventory roads which currently or could during development access hazardous areas of the mine and pose safety hazards for hunters or recreationists during operations. These roads would be reclaimed and/or blocked off during operations reducing safety risks to hunters or recreationists (REC-1 in Table 2.4-1). Wildlife habitat could be increased by enhancing the reclamation success of poorly reclaimed areas which could increase hunting opportunities within the Project Area.

4.5.1.2.2 Monitoring and/or Compliance

No monitoring or compliance would be associated with recreation resources.

4.5.1.3 No Action Alternative

Under the No Action Alternative, no uranium mining would take place in the Sheep Mountain Project Area and no ore processing would occur at either the Sheep Mountain Project Area or at the Sweetwater Mill. As a result, recreation activities would continue at levels comparable to that of recent years. Ongoing reclamation for which Energy Fuels has obligations would continue under this alternative as well as reclamation under WDEQ-AML Project 16-O (BLM, 2014b). Opportunities for recreational users would increase as the area becomes less industrialized and wildlife habitat increases with reclamation, creating better opportunities for hunters.

4.5.2 Livestock Grazing

Potential issues associated with livestock grazing were identified by the BLM through the public scoping process, as well as internal scoping. Issues include:

- Loss of forage through removal and construction of new roads;
- Hazards posed to livestock due to increased Project-related traffic;
- Potential impacts to existing water sources and range improvements;
- Potential effects from the spread of noxious weeds and invasive species; and
- Potential effects to seasonal livestock movement within grazing allotments.

4.5.2.1 Proposed Action Alternative

4.5.2.1.1 Impacts with On-Site Processing

The direct effect to grazing resources through forage removal would occur during Construction and Operations. Surface disturbance would occur on two grazing allotments coinciding with the Project Area. Disturbance for the Congo Pit and Hank's Draw Spoils Facility would be located on the Mountain Allotment. The Ore Processing Facility would be located on Crooks Gap Allotment. About 356.5 acres of new disturbance across both grazing allotments would result from the Proposed Action. The Project would also utilize approximately 572.5 acres of existing or previously disturbed lands. Based on existing conditions, including steep slopes, existing surface disturbance, fenced areas, limited water sources, and low carrying capacity, the area lacks contributing rangeland for livestock grazing in the two allotments and therefore, effects are expected to be minimal. No range improvement sites exist within the Project Area and therefore, none would be affected. When the permit renewal for the Crooks Gap and Mountain allotments are up for renewal, the effects of the Project will be considered in the AUM's permitted in these allotments.

Indirect effects to grazing could occur if available forage is reduced or converted due to the potential spread of invasive non-native species and noxious weeds and increased fugitive dust. Additionally, the amount of available forage near roads also could be impacted by fugitive dust, making vegetation unpalatable. However, these effects are expected to be minimal given the low carrying capacity in the Project Area.

Effects of uranium and radium chemical toxicity and radiation on grazing cattle during operation and post-reclamation of the Project are not expected given the overall low carrying capacity of the Project Area and potential effects such as those described above in Section 4.3.5.1.1 for big game.

Cattle could be directly affected by Project-related traffic which could cause vehicle-cattle collisions, spooked herds, and cattle trailing disruptions. Cattle could also be directly affected if they come in contact with potential hazards in the Project Area; however, most of these areas would be fenced, except for the highwalls of the Congo Pit which would be bermed (4 feet tall) and ditched to divert water and promote safety. There is a potential that cattle could overtake the 4 foot berm and fall into the pit.

4.5.2.1.2 Impacts with Off-Site Processing

Potential impacts to grazing resources with off-site processing would be similar to those described above for on-site processing. Additional traffic associated with trucking ore from the Project Area to the Sweetwater Mill would increase the potential for traffic-related effects described above. Impacts to water sources and vegetation for forage for livestock associated with Crooks Creek through surface discharge under the approved WYPDES Permit are anticipated to only be minor. As described in Section 4.2.5.1.2 and 4.3.3.1.2, the average increase in flow rate (from 2.3 to 3.2 cfs) is so miniscule as to be inconsequential to the vegetation and health regimes of riparian areas along Crooks Creek, but the increase in flow from the lowest recorded flows in Crooks Creek (from 4.8 to 5.7 cfs) may provide more consistent, year-round flow in the creek making livestock utilize Crooks Creek more frequently during operations (short term, indirect, beneficial impact). However, once discharge ceases, these livestock could be negatively impacted as the water in the creek would decrease, but not disappear, leading to only minor, long term impacts. Any additional impact to grazing resources at the Sweetwater Mill is not anticipated considering the mill currently exists and is a licensed facility with the NRC. If any changes or updates to the existing permits become necessary at the Sweetwater Mill, the appropriate agencies would conduct separate NEPA analyses as necessary.

4.5.2.1.3 Monitoring and/or Compliance

Environmental and Operational Monitoring Programs and Compliance are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B.

4.5.2.2 <u>BLM Mitigation Alternative</u>

4.5.2.2.1 Impacts

Mining under this alternative would be the same as under the Proposed Action. The Proposed Action describes reclaiming lands to the previous land use of grazing and wildlife habitat. Under this alternative, reclamation could be more successful and more likely to progress faster. Noxious weeds and invasive species would potentially be under more scrutiny and thus could reduce threats to grazing resources. The impacts on forage from fugitive dust would likely be lessened under this alternative. Fencing of the Congo Pit highwalls would more effectively decrease potential falls, entrapments, or other impacts to livestock under the BLM Mitigation Alternative than the berms described under the Proposed Action (WHB-1 in Table 2.4-1). Fencing of disturbance would facilitate reclamation success beyond that under the Proposed Action (W-4).

4.5.2.2.2 Monitoring and/or Compliance

Monitoring and/or Compliance under the BLM Mitigation Alternative would be similar to that under the Proposed Action Alternative. Additional monitoring may occur as a result of implementation of the revised Reclamation Plan and Weed Management Plan.

4.5.2.3 <u>No Action Alternative</u>

Under the No Action Alternative, mining and ore processing would not take place within the Project Area or on area access roads. As a result, livestock grazing in the area would continue at levels comparable to those of recent years. Thus, there would be no need for mitigation and monitoring. Reclamation under Energy Fuels' Reclamation Plan in the WDEQ-LQD Permit to Mine 381C and WDEQ-AML Project 16-O would continue. Implementation of these plans could increase available forage in the Project Area.

4.6 UNAVOIDABLE ADVERSE IMPACTS

NEPA section 102(c) mandates disclosure of “any adverse environmental effects which cannot be avoided should the proposal be implemented.” These are impacts for which there are no mitigation measures or impacts that remain even after the implementation of mitigation measures. Implementation of the Proposed Action would result in unavoidable adverse impacts to some resources. The CEQ regulations (40 CFR § 1500.2(e)) define unavoidable adverse impacts as those that cannot be avoided due to constraints in alternatives. These impacts do not have to be avoided by the planning agency, but they must be disclosed, discussed, and mitigated, if possible.

4.6.1 Unavoidable Adverse Impacts under the Proposed Action Alternative

Unavoidable adverse impacts to soils and vegetation could occur where topsoil is stripped and/or compacted during mining operations. Effects to surface water would be unavoidable where ephemeral drainages may be rerouted, and effects to groundwater would be unavoidable due to withdrawal. Unavoidable adverse impacts might occur to wildlife where habitat is removed. If unknown cultural, tribal, and/or paleontological resources were excavated, those effects would be unavoidable. Effects to recreation and grazing resources would be unavoidable during Operations and Reclamation but would resume following Project completion. These impacts are unavoidable and adverse to the existing conditions; however, none of these impacts would result in undue or unnecessary degradation of public lands as defined in 43 CFR § 3809.5.

4.6.2 Unavoidable Adverse Impacts under the BLM Mitigation Alternative

Unavoidable adverse impacts would be the same as those described under the Proposed Action Alternative.

4.6.3 Unavoidable Adverse Impacts under the No Action Alternative

The Proposed Action would re-disturb and reclaim about 572.5 acres of land that was previously disturbed and either not reclaimed or reclaimed to older, less stringent standards. Unavoidable adverse impacts to soils, vegetation, and surface waters would continue through the exposure of any unreclaimed or older reclaimed areas within the 572.5 acres that would not be reclaimed under the No Action Alternative.

4.7 RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY (ALL RESOURCES)

The CEQ establishes (40 CFR § 1502.16) that the balance or trade-off between short-term uses and long-term productivity needs to be defined in relation to the activity in question. The decision maker and members of the public need a clear sense of what they are gaining or losing in both the short- and long-term. For the purpose of this analysis, the short-term is considered Operations and Reclamation and the long-term begins after Reclamation.

4.7.1 Relationship of Short-Term Uses and Long-Term Productivity under the Proposed Action Alternative

All resources identified as relevant in Chapter 3 and described and analyzed in Chapters 3, 4, and 5 would be affected by the change of short-term land use to mineral development. These short-term uses have potential to affect the long-term productivity of these resources as identified in Chapter 4. Beneficial effects to people in the short-term would include employment and generation of revenue. Long-term productivity of resources such as, soils, vegetation, groundwater, wildlife habitat, and livestock grazing would be expected to return or continue following successful reclamation of the Project Area.

4.7.2 Relationship of Short-Term Uses and Long-Term Productivity under the BLM Mitigation Alternative

Short-term uses and long-term productivity would be the same as those described under the Proposed Action Alternative.

4.7.3 Relationship of Short-Term Uses and Long-Term Productivity under the No Action Alternative

Under the No Action Alternative, short-term uses would include reclamation of some portions of the Project Area, which would lead to long-term productivity of those areas in terms of soils, vegetation, wildlife habitat, and livestock grazing resources. The Proposed Action would re-disturb and reclaim about 572.5 acres of land that was previously disturbed and either no reclaimed or reclaimed to older, less stringent standards. Long-term productivity of any unreclaimed or older reclaimed areas would remain compromised within the 572.5 acres that would not be reclaimed under the No Action Alternative.

4.8 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS (ALL RESOURCES)

Irreversible commitments are those that cannot be reversed, except perhaps in the extreme long-term. Examples of irreversible impacts would be species extinction, ore extraction, and logging of an old growth forest.

Irretrievable commitments are those that are lost for a long period of time. Extraction of uranium would constitute an irretrievable impact because the mineral cannot be renewed in the current location within a reasonable timeframe.

Impacts to resources can be both irreversible and irretrievable. Management actions most likely to result in irreversible and/or irretrievable impacts include those related to development and surface disturbance such as mineral extraction and energy development.

4.8.1 Irreversible and Irretrievable Commitments of Resources under the Proposed Action Alternative

As shown in Table 4.8-1, the only irreversible and irretrievable commitment would be the extraction of the uranium ore. If cultural, paleontological, or tribal resources were unexpectedly excavated, effects to those resources could be irreversible and/or irretrievable.

Table 4.8-1
Irreversible and Irretrievable Commitment of Resources

Affected Resource	Irreversible Commitment	Irretrievable Commitment
Climate, Climate Change, and Air Quality	No	No
Geologic/Mineral	Yes	Yes
Soils	Possible [1]	Possible [1]
Water (Surface, Ground, Water Use	No	No
Invasive, Non-Native Species	No	No
Vegetation	Possible [1]	Possible [1]
Wetlands and Riparian Zones	No	No
Special Status Species	No	No
Wildlife	No	No
Wild Horse and Burros	No	No
Cultural	Possible	Possible
Paleontological	Possible	Possible
Tribal	Possible	Possible
Socioeconomic	No	No
Environmental Justice	No	No
Transportation/Access	No	No
Public Health and Safety	No	No
Recreation	No	No
Livestock Grazing	No	No

[1] If the On-Site Ore Processing Facility is constructed, then up to 90 acres of public lands and 115 acres of private lands would be reclaimed in accordance with NRC requirements for long-term stability, which could include rock cover for erosion protection, rather than replacement of soil and vegetation.

4.8.2 Irreversible and Irretrievable Commitments of Resources under the BLM Mitigation Alternative

Effects would be the same as those described for the Proposed Action Alternative.

4.8.3 Irreversible and Irretrievable Commitments of Resources under the No Action Alternative

The No Action Alternative would not result in irreversible or irretrievable commitments of resources as portions of the site would continue to be reclaimed.

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Chapter 5.0
Cumulative Effects

5.1 INTRODUCTION

Cumulative effects are defined in the CEQ regulations (40 CFR § 1508.7) as "*...the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions*." The cumulative effects analysis typically encompasses broader areas and timeframes than the analysis of direct and indirect effects. The actions and effects selected for analysis depend on access to reasonably available data.

5.2 CUMULATIVE IMPACT AREAS ANALYZED

The areas to be analyzed for cumulative effects have been selected based on several criteria. Common analysis areas have been used for different resources, where such usage is logically defensible. The analysis areas selected for each analyzed resource and the rationales for those selections are provided in Table 5.2-1. Maps 5.2-1, 5.2-2, 5.2-3, and 5.2-4 show the Cumulative Impact Analysis Areas (CIAAs) as well as the specific past, present, and reasonably foreseeable projects described in Section 5.3.

5.3 ACTIONS ANALYZED

This section provides the past, present, and reasonably foreseeable future actions (RFFAs) within the CIAAs associated with each analyzed resource. For this analysis, foreseeable actions are considered to be limited to those for which some formal notice or permit application has been made and does not include potential developments which are speculative. Levels of surface disturbance are used as best estimates to evaluate total impacts to the human environment. The rationale is that levels of surface disturbance are among the most comprehensive and readily determined impacts and because disturbance to the surface results in direct and indirect effects to many analyzed resources.

Generally, past and ongoing activities (natural and man-made) that have affected and are affecting the Project Area and surrounding areas include but are not limited to the following:

- mining;
- oil and gas exploration and development;
- rights-of-way or other land uses (power lines, pipelines, roads);
- wildland fire;
- drought;
- wildlife utilization;
- climate change;
- livestock grazing;
- dispersed recreation (i.e., hunting, camping, etc.); and
- off-highway vehicle (OHV) use.

The sections that follow provide more detailed information about specific past and present actions and RFFAs.

Table 5.2-1
Sheep Mountain Uranium Project EIS Cumulative Impact Analysis Areas (CIAAs) and Rationale

Resource	Cumulative Impact Analysis Area	Rationale
Physical Resources		
Air Quality	Far-field impacts of project-specific emissions as well as cumulative emissions impacts were assessed in a region centered on the Project Area within 12-km and 4-km resolution grids centered on and surrounding the Project Area (see Maps 5.4-1 and 5.4-2).	Impacts are required to be assessed for criteria pollutants, visibility, and atmospheric deposition. Criteria pollutant impacts were assessed in all areas of the regional modeling domain. Impacts on visibility were assessed at designated Class I and II areas, and impacts of atmospheric deposition were assessed at sensitive lakes.
Geology and Minerals	The CIAA for geology and minerals is an approximate 10-mile buffer around the Project Area, which includes the north central portion of the Great Divide Basin (see Map 5.2-3).	The selection of a 10-mile buffer around the Project Area is based on a balance between assessing an area large enough to evaluate an aggregate of actions and yet not so large that the impacts of the Sheep Mountain Uranium Project would be lost among other larger projects. It is a reasonable distance to consider the cumulative effects of hauling mineral materials for use in the Project Area. Potential indirect impacts to geology and mineral resources are not likely to extend across the entire planning area for the LFO, which covers 6.6 million acres in Fremont, Natrona, Carbon, Sweetwater, and Hot Springs counties, or the planning area for the Rawlins Field Office, which covers 3.5 million acres in Carbon, Albany, Laramie, and Sweetwater counties. Cumulative effects would likely be limited to a distance smaller than the 10-mile buffer; therefore, the buffer is conservative for analysis purposes.
Soils	The CIAA for soil resources is the Project Area.	Cumulative impacts on soil resources would be limited to soil disturbance and soil quality degradation within the Project Area because these effects do not act in combination with similar effects outside the Project Area.
Water (Surface, Groundwater, Water Use)	The CIAA for surface water includes the Crooks Creek watershed including Sheep Creek (see Map 5.2-2). The CIAA for groundwater resources is a 15-mile buffer from the Project Area (see Map 5.2-3). The CIAA for water use is the Project Area.	This is the watershed that has connectivity with the Project Area. A 15-mile buffer from the Project Area is a reasonable distance to consider potential effects from drawdown or water quality impacts considering the proximity to other similar projects that have the potential to impact the Project Area aquifers. Water use would be minimal; therefore, the Project Area would encompass any effects.

Resource	Cumulative Impact Analysis Area	Rationale
Biological Resources		
Invasive, Non-Native Species	The CIAA for invasive, non-native species includes the Project Area plus a 10-mile buffer as well as the travel route to the Sweetwater Mill and a 5-mile buffer around the route and the Sweetwater Mill (see Map 5.2-2).	Cumulative impacts associated with invasive, non-native species would be expected to be limited to the Project Area and the travel route to the Sweetwater Mill if noxious weed management measures are implemented. To be conservative, projects within a 10-mile buffer were included in the cumulative analysis in addition to the travel route to the Sweetwater Mill.
Vegetation, Special Status Plant Species	The CIAA for vegetation and special status plant species is the Project Area.	Cumulative impacts to vegetation and special status plant species would be limited to the Project Area if noxious weed management measures are implemented. As with all cumulative resource analyses, the selection of the Project Area is based on a balance between assessing an area large enough to evaluate an aggregate of actions and yet not so large that the impacts of the Sheep Mountain Uranium Project would be lost among other larger projects.
Wetlands and Riparian Zones	The CIAA for wetlands and riparian zones includes the Project Area plus a 1-mile buffer around the Project Area border (see Map 5.2-3).	This area includes the wetland areas that are within or adjacent to the Project Area.
Special Status Wildlife Species	The CIAA for special status wildlife species and bats is the Project Area plus a 10-mile buffer (see Map 5.2-3).	Home ranges for special status wildlife species have the potential to expand outside the Project Area in contiguous habitats. Bats potentially roosting in the Project Area could forage 10 miles away.
	The CIAA for greater sage-grouse includes the Project Area plus a 10-mile buffer as well as the travel route to the Sweetwater Mill and a 5-mile buffer around the route and the Sweetwater Mill (see Map 5.2-2).	The Project Area is not in greater sage-grouse core area. Known leks are within a 10-mile radius of the Project Area and all leks are within core areas. A 10-mile buffer around the Project Area, which includes the access road from Jeffrey City, and a 5-mile buffer around the travel route to the Sweetwater Mill together with the Sweetwater Mill encompass home ranges for greater sage-grouse that could be affected by cumulative impacts.
Wildlife (includes Fisheries)	The CIAA for big game includes the Project Area plus a 22-mile buffer, which incorporates the Sweetwater Mill (see Map 5.2-4).	The CIAA for big game includes portions of the pronghorn Beaver Rim and Red Desert herd units, portions of the Mule Deer Sweetwater Herd Unit, portions of the Elk Green Mountain Herd Unit, and portions of the Moose Lander Herd Unit. The buffer is intended to incorporate a portion of the big game species' seasonal ranges and migration routes within their respective herd units. The 22-mile buffer is a reasonable distance to account for cumulative effects to big game.

Resource	Cumulative Impact Analysis Area	Rationale
	The CIAA for raptors is the Project Area plus a 10-mile buffer (see Map 5.2-3).	Home ranges for raptors have the potential to expand outside the Project Area in contiguous habitats, particularly larger species such as golden eagles or ferruginous hawks. A 10-mile buffer around the Project Area encompasses home ranges for these species that could be affected by cumulative impacts.
	The CIAA for other general wildlife, including leopard frogs and sensitive migratory bird species, is the Project Area plus a 1-mile buffer (see Map 5.2-3).	Home ranges vary among species, and a 1-mile buffer around the Project Area encompasses home ranges of species that occupy the Project Area and could be affected by cumulative impacts.
	The CIAA for fisheries includes the Upper Crooks Creek, Middle Crooks Creek, and Lower Crooks Creek sub-watersheds (see Map 5.2-2).	These are the sub-watersheds that have connectivity with the Project Area, which is located in the Middle Crooks Creek sub-watershed.
Wild Horse and Burros	The CIAA for wild horse and burros includes the Project Area and the Green Mountain and Crooks Mountain HMAs (see Map 5.2-4).	This area includes the rangelands that support wild horses in the region. The Project Area is located in the Green Mountain HMA. The Crooks Mountain HMA is approximately 6 miles west of the Project Area.
Heritage Resources and Human Environment		
Cultural Resources	The Cultural Resources CIAA includes the Project Area plus up to 15 miles from the Project Area. The indirect visual CIAA extends up to 15 miles from the Project Area and includes any historic properties, where setting is important, from which the Project Area is visible. This includes the Crooks Gap Stage Station, the Rawlins to Fort Washakie Road, and the National Historic Trails corridor (see Map 5.2-3).	Given the scale of proposed development, the visual CIAA encompasses the foreground, middleground, and background areas (up to 15 miles) where viewsheds of significant cultural resources may be impacted by development within the Project Area. Due to terrain, many historic properties within 15 miles of the Project Area would not be visible and do not need to be included in the CIAA.
Paleontological Resources	The CIAA for paleontological resources is the Project Area.	Cumulative impacts on paleontological resources would be limited to areas with surface disturbance.
Tribal and Native American Religious Concerns	The Tribal and Native American Religious Concerns CIAA include the Project Area plus up to 15 miles from the Project Area where sites of religious or cultural significance may be visually impacted (see Map 5.2-3).	This area includes the two sites identified by tribal representatives as of potential religious or cultural significance: the Crooks Gap Stage Station and an intact segment of the Rawlins to Fort Washakie Road (see Section 3.4.3). Due to terrain, many other potential sites of religious or cultural significance within 15 miles of the Project Area would not be visible and do not need to be included in the CIAA.

Resource	Cumulative Impact Analysis Area	Rationale
Socioeconomics	The Socioeconomic CIAA includes Fremont and Carbon counties with additional attention to Sweetwater County to the extent warranted to include potential effects of processing at the Sweetwater Mill (see Map 5.2-1).	Carbon and Fremont counties could be directly impacted by the proposed Project. Sweetwater County could also be impacted if ore is processed off-site at the Sweetwater Mill in Sweetwater County.
Environmental Justice	The Environmental Justice CIAA includes Fremont and Carbon counties with additional attention to Sweetwater County to the extent warranted to include potential effects of processing at the Sweetwater Mill (see Map 5.2-1).	Populations in other counties are not sufficiently integrated with mining activities in southeast Fremont County or milling activities in northeast Sweetwater County for impacts to be of relevance.
Transportation/Access	The Transportation/Access CIAA includes roadway systems in Fremont, Carbon, and Sweetwater counties (see Map 5.2-1).	The major transportation routes that serve the Project Area pass through these counties.
Public Health and Safety (includes Wastes)	The CIAA for the storage of hazardous materials is the Project Area. The impact area for the transportation of hazardous materials includes the Project Area and designated access routes for the Project Area and Sweetwater Mill.	This area is sufficient for a cumulative effects analysis for public health and safety.
Land Resources		
Recreation	The CIAA for recreation includes the Project Area and the surrounding area within approximately 5 miles of the Project Area boundary and primary access routes between the Project Area and the Sweetwater Mill (see Map 5.2-3).	The selection of a 5-mile buffer around the Project Area and primary access routes is based on a balance between assessing an area large enough to evaluate an aggregate of actions and yet not so large that the impacts of the Sheep Mountain Project would be lost among other larger projects. Potential indirect impacts to recreational resources are not likely to extend across the entire planning area for the LFO, which covers 6.6 million acres in Fremont, Natrona, Carbon, Sweetwater, and Hot Springs counties, or the planning area for the Rawlins Field Office, which covers 3.5 million acres in Carbon, Albany, Laramie, and Sweetwater counties.
Livestock Grazing	The CIAA for livestock grazing includes the full extent of the two grazing allotments that overlap the Project Area, the Mountain Allotment and Crooks Gap Allotment (see Map 5.2-3).	Grazing allotments are the geographic units within which the BLM manages livestock grazing and defines the type, level, and areas of livestock use by individual permittees. The CIAA encompasses the full extent of the grazing allotments that would be directly and indirectly affected by the Project and cumulative impacts.

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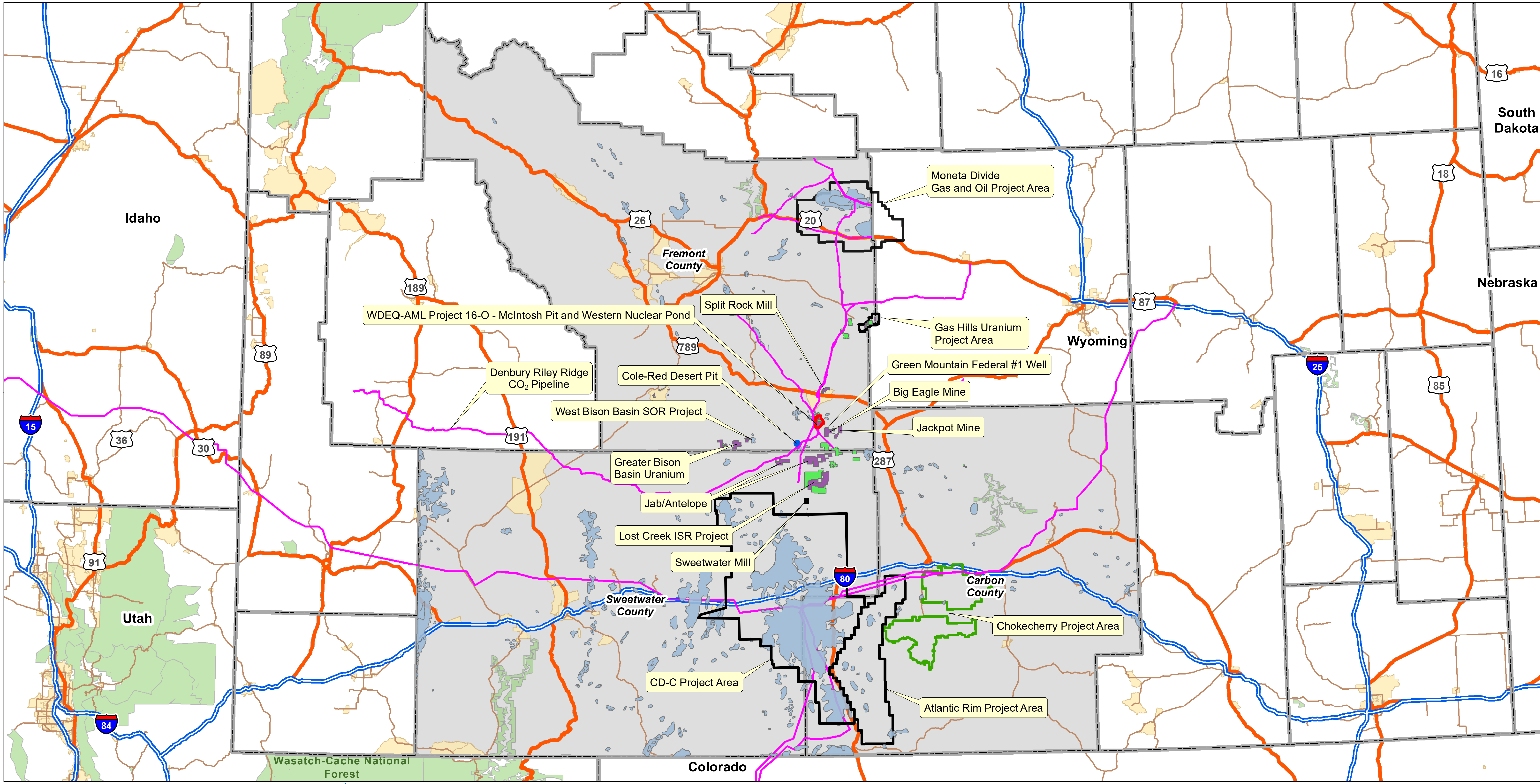

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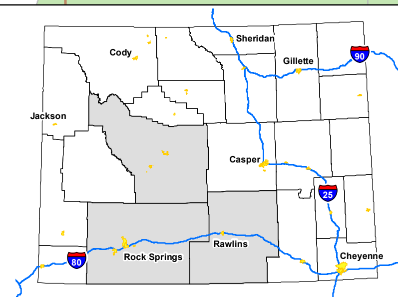


Project Area
CIAA Boundary

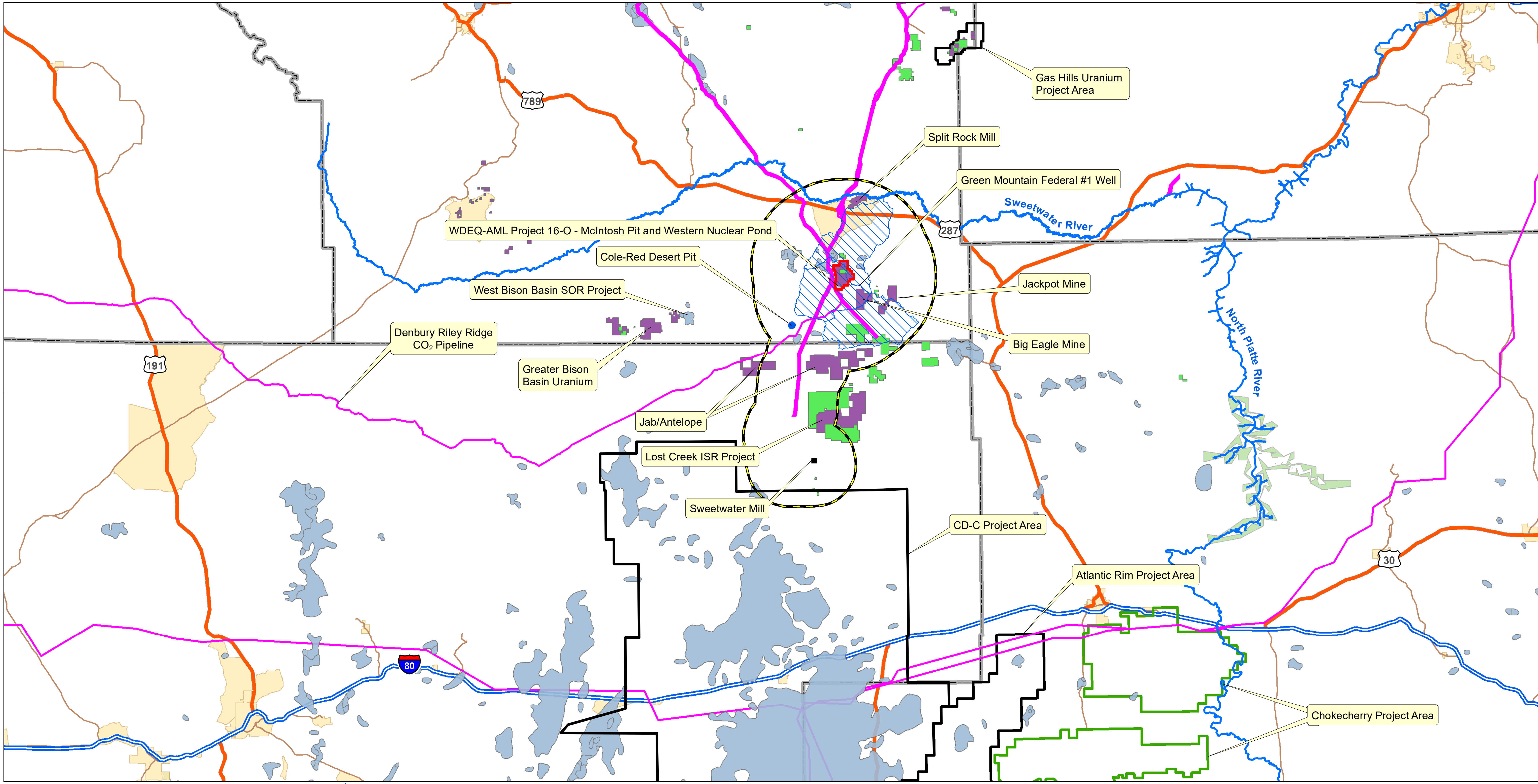
Past, Present, and RFFAs
Mining
Mining Exploration
Oil and Gas Exploration and Development
CD-C, Gas Hills, Moneta Divide, and Atlantic Rim Projects
Chokecherry and Sierra Madre Wind Energy Project
Proposed Rights-of-Way

WY County Line
City Limits
Parks and Forests
Interstate
State Highway
Local Road
Other Road

Map 5.2-1

Cumulative Impact Analysis Area

(Socioeconomics, Environmental Justice, Transportation/Access)



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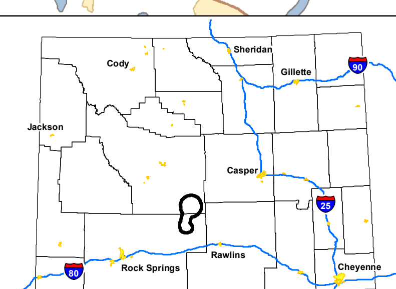


- Project Area
- Surface Water, Fisheries CIAA
- Sage Grouse, Invasive Species CIAA

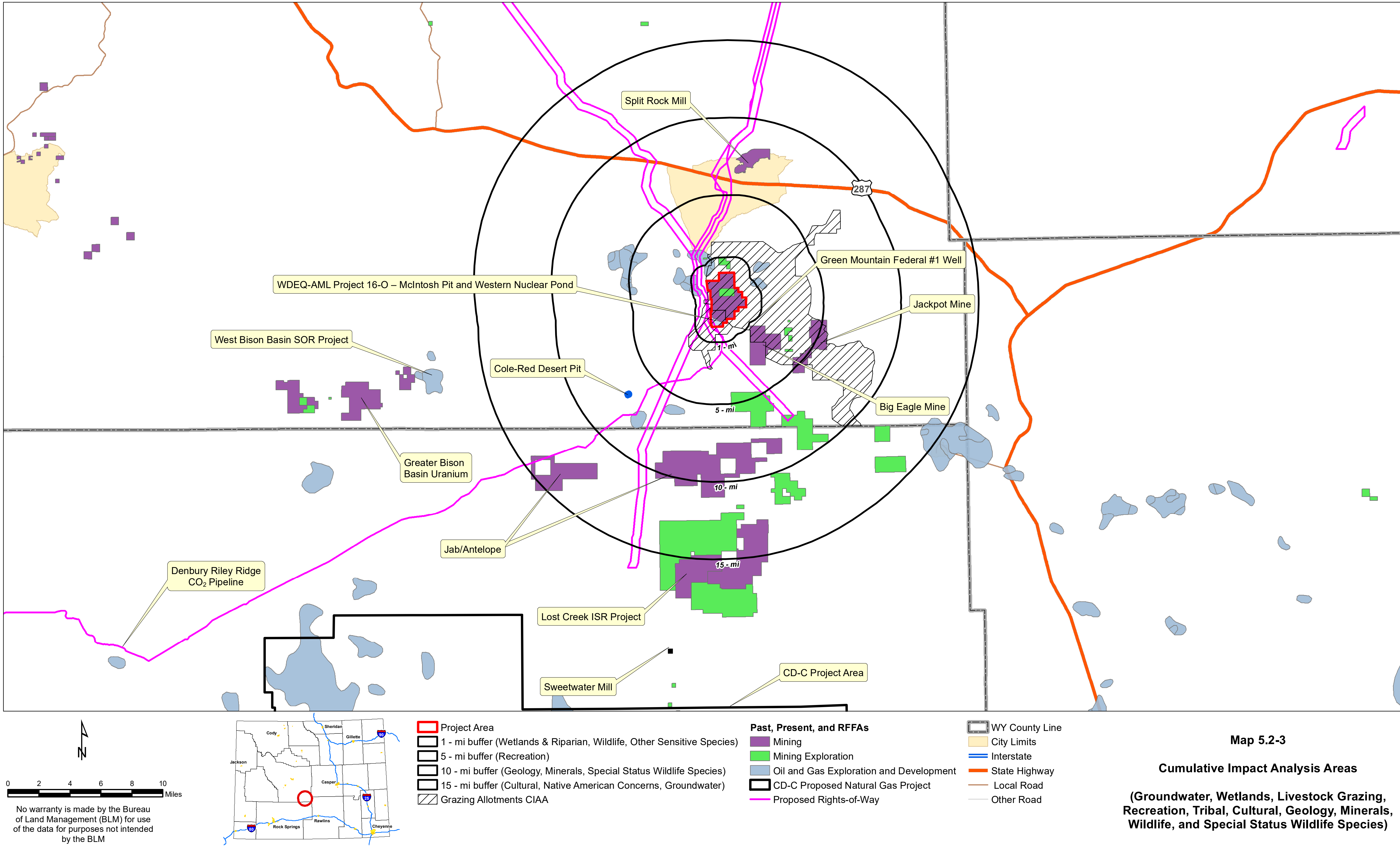
Past, Present, and RFFAs
- Mining
- Mining Exploration
- Oil and Gas Exploration and Development
- CD-C, Gas Hills, Moneta Divide, and Atlantic Rim Projects
- Chokecherry and Sierra Madre Wind Energy Project
- Proposed Rights-of-Way

- WY County Line
- City Limits
- Interstate
- State Highway
- Local Road
- Other Road

Map 5.2-2

Cumulative Impact Analysis Areas

(Surface Water, Fisheries, Invasive Species and Greater Sage-Grouse)



No warranty is made by the Bureau of Land Management (BLM) for use of the data for purposes not intended by the BLM

Project Area	
1 - mi buffer (Wetlands & Riparian, Wildlife, Other Sensitive Species)	
5 - mi buffer (Recreation)	
10 - mi buffer (Geology, Minerals, Special Status Wildlife Species)	
15 - mi buffer (Cultural, Native American Concerns, Groundwater)	
Grazing Allotments CIAA	

Past, Present, and RFFAs

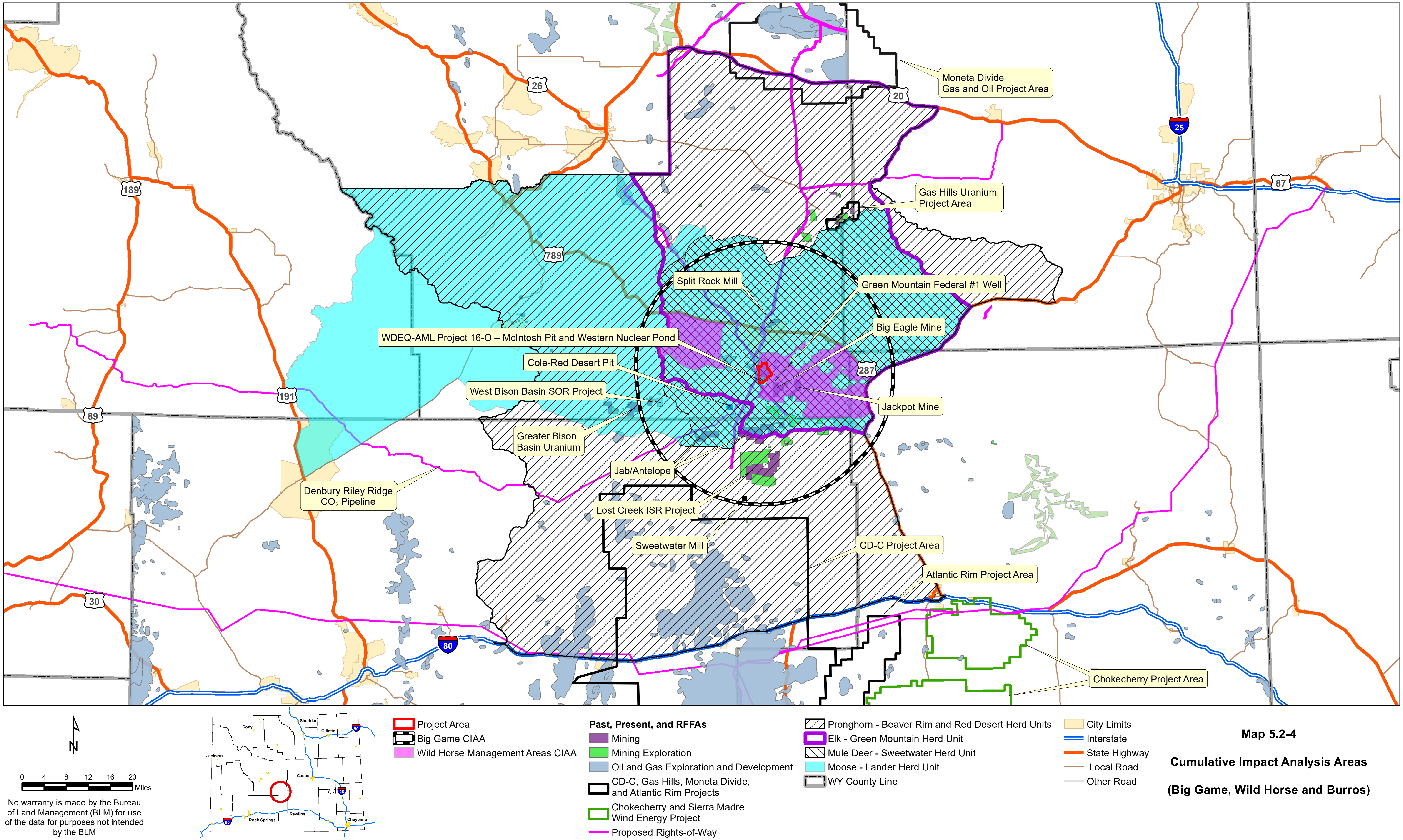
- Mining
- Mining Exploration
- Oil and Gas Exploration and Development
- CD-C Proposed Natural Gas Project
- Proposed Rights-of-Way

- WY County Line
- City Limits
- Interstate
- State Highway
- Local Road
- Other Road

Map 5.2-3

Cumulative Impact Analysis Areas

(Groundwater, Wetlands, Livestock Grazing, Recreation, Tribal, Cultural, Geology, Minerals, Wildlife, and Special Status Wildlife Species)



Map 5.2-4

Cumulative Impact Analysis Areas

(Big Game, Wild Horse and Burros)

5.3.1 Past and Present Actions

Past disturbance within and surrounding the Sheep Mountain Project Area is primarily associated with uranium mining. Many of the areas disturbed by past mining have been or are being reclaimed. For a description of past disturbances within the Sheep Mountain Project Area see Chapter 2 and Map 2.2-1. Present actions are mainly associated with uranium reclamation and mining, oil and gas activities, and a gravel pit. Summary descriptions of the various past and present projects within the CIAAs follow.

Big Eagle Mine. The Big Eagle Mine is an open pit uranium mine on private, patented ground on the south side of Green Mountain, last producing in 1999. The mine consists of two open pit lakes, a processing facility, and reclaimed spoils piles. Total disturbance associated with the Big Eagle Mine is approximately 440 acres.

Jackpot Mine. The Jackpot Mine is a reclaimed underground uranium mine on the south side of Green Mountain that was never put into production. The features associated with the mine consist of several monitoring wells on top of Green Mountain, a plugged shaft, and fencing. The reclaimed area of the Jackpot Mine totals approximately 31 acres.

WDEQ-AML Project 16-0-McIntosh Pit and Western Nuclear Pond. The McIntosh Pit is the primary mine feature included in the WDEQ-AML Project and lies within the Sheep Mountain Project Area. Energy Fuels, through WDEQ-LQD Permit to Mine 381C, was responsible for reclamation of a portion of the pit, specifically reduction of some of the northern highwalls and a one-time shock treatment of the pit water with barium chloride to reduce radium levels. A portion of the permit reclamation bond was allocated to that highwall reduction and one-time water treatment. To facilitate the complete pit reclamation by WDEQ-AML, Energy Fuels turned over the amount of the Permit 381C reclamation bond allocated to that work to WDEQ-AML, removing Energy Fuels' obligation for the partial highwall reduction and one-time water treatment.

The McIntosh Pit, which is a mine pit from the 1970s, is currently a groundwater impoundment surrounded by 100-foot to 300-foot highwalls. Western Nuclear Pond also resulted from historic mining activities, specifically spoils piles blocking Quaking Asp Creek. The pond collects surface water drainage from approximately 2,286 acres, allowing it to maintain a pool year-round except in the worst prolonged drought conditions. The pond supports aquatic life and is stocked by the WGFD; therefore, its enhancement and maintenance is a key aspect of the reclamation design for this project. Currently, the pond seeps through its embankment and can overflow to an ephemeral drainage which flows to Crooks Creek via an existing overflow pipe (BRS, 2014).

The goals of the project are to: construct a geomorphic reclamation surface which will be hydrologically stable; eliminate hazards posed by highwalls and spoils piles; enhance Western Nuclear Pond for the benefit of wildlife and stock; promote vegetative success and diversity; and preserve existing water rights. To achieve these goals, the proposal includes backfilling McIntosh Pit above the historic groundwater elevation (approximately 11 million cubic yards of backfill), reducing the highwalls. The proposal also includes reducing leakage from Western Nuclear Pond by removing a pipe drain and by installing an impermeable key downstream of the pond. The disturbance associated with this work will be reclaimed by application of topsoil or coversoil and subsequent revegetation. The resulting surface water system will allow for: additional water storage in Western Nuclear Pond and a channel for overflow of water from the pond to a new, constructed impoundment where McIntosh Pit had been; and the system will allow overflow of water from the new, constructed impoundment through an ephemeral drainage to Crooks Creek (BRS, 2014). Figure 5.3-1 is an illustration of the reclaimed surface once the WDEQ-AML work is completed (BRS, 2014).

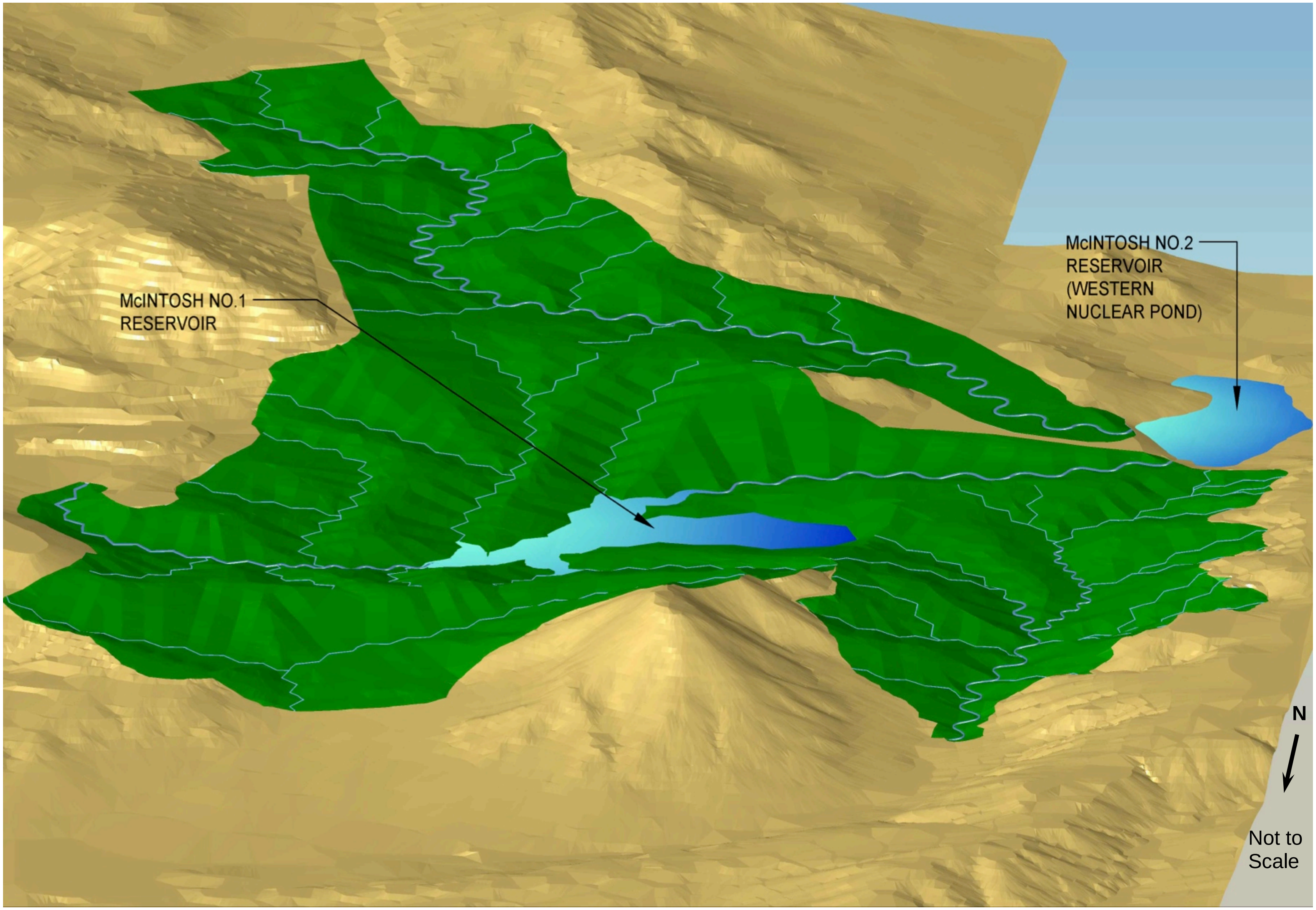


Figure 5.3-1
McIntosh Pit Reclamation Project

The WDEQ-AML program commenced Project 16-O in mid-2014. Total disturbance associated with the WDEQ-AML Project is estimated to be 300 acres, primarily on privately owned lands.

Lost Creek Uranium In-Situ Recovery Project. Lost Creek ISR, LLC (LCI) has been approved for construction, operation, and reclamation of facilities for ISR operations within the Lost Creek Permit Area (BLM, 2012b). ISR involves the use of a recovery solution, known as a lixiviant, to extract the mineral from the geologic formation, and the mineral is removed from the solution using ion exchange resins at the processing facility. ISR occurs without physically removing the ore-bearing strata. Approximately 6 million pounds of uranium could be produced from the Permit Area. The project began operations in Fall 2012 and will continue production for approximately 7 years, with reclamation continuing for another 5 years. With appropriate regulatory approval, the processing facilities could also be used to process ion exchange resins from other ISR mines in the region after completion of mineral recovery in the Permit Area.

The Lost Creek Project Area contains approximately 4,377 acres within the project boundary, with no more than 345 acres actual surface disturbance. Most of the surface disturbance is/would be related to construction of the well fields used to extract the uranium from the subsurface. See the Lost Creek Uranium ISR Project Final EIS and Record of Decision for more information (BLM, 2012b).

Sweetwater Mill. The Sweetwater Mill is the existing conventional uranium mill facility that may be used for off-site processing under the Proposed Action/BLM Mitigation Alternative (see Chapter 2). This facility consists of tailings ponds, processing buildings, shop/warehouse buildings, administrative buildings, roads, pipelines, one large reclaimed spoils pile, one reclaimed open pit mine (pit lake), and one reclaimed soils remediation area, totaling approximately 950 acres of reclaimed and existing disturbance.

Split Rock Mill. The Split Rock Mill is a reclaimed conventional uranium mill that operated from 1957 to 1981 to the northeast of Jeffrey City. There was no mining at the mill site; the ore processed by the mill came from mines in the region. The disturbance associated with the mill and reclamation totals about 1,172 acres, and the site is being transferred to the DOE for long-term care (DOE, 2012). The DOE Long Term Care Boundary associated with the mill includes an additional 3,046 acres.

Mining Exploration Notices. There are approximately nine authorized or expired 43 CFR § 3809.31 Notices for exploration of mining claims located within the CIAA. The Notices consist of exploratory drilling or trenching activities for uranium and jade, which allow for up to 5 acres of disturbance per notice. Therefore, for purposes of analysis, it is assumed that 45 acres in total are disturbed as a result of these Notices within the CIAAs.

Existing Oil and Gas Fields. There are numerous existing oil and gas fields in the region that have been in production since 1935. Development in these fields varies but generally consists of roads, pipelines, power distribution, well pads, and wells which disturb only a portion of the areal extent of the field. For the purposes of this analysis, 15 percent of the area within the extent of the field boundary is assumed to be disturbed, as summarized in Table 5.4-1 (BLM, 2013b).

Cole-Red Desert Pit. The Cole-Red Desert pit is a Mineral Material Sale for gravel and equals 5 acres of disturbance.

5.3.2 Reasonably Foreseeable Future Actions

RFFAs include uranium mining and reclamation and oil and gas activities. Oil and gas activities require development of roads, pipelines, power distribution, well pads, and wells. The following is a brief description of the RFFA's that might fall within the CIAAs depending on resource.

Jab/Antelope. Jab/Antelope is a Plan of Operations for uranium exploration exceeding 5 acres owned by Uranium One. There are currently no future plans regarding additional activities besides reclamation at this project, but it is an active Plan of Operations with the potential to disturb approximately 50 acres.

Greater Bison Basin Uranium Project. The Greater Bison Basin Uranium Project is a Plan of Operations for uranium exploration exceeding 5 acres of disturbance as proposed by WildHorse Energy in 2011. There are currently no future plans regarding additional activities besides continued use of monitoring wells, but it is a pending Plan of Operations with the potential to disturb approximately 35 acres.

Lost Creek Uranium In-Situ Recovery Project. On September 14, 2015, a Notice of Intent to Prepare an EIS was published in the Federal Register for the amendment to the Lost Creek Uranium ISR Project. This amendment includes adding approximately 5,750 acres to the project area resulting in 650 acres of new disturbance from the proposed development of five new mine units and expansion to a deeper uranium-bearing horizon in the existing Project Area. This also includes an increase in uranium production from 1 million pounds per year to 2.2 million pounds per year (BLM, 2015b).

International Petroleum and Exploration Operating Corporation Green Mountain Federal # 1. International Petroleum and Exploration Operating Corporation (IPEOC) filed an Application for Permit to Drill (APD), which was approved on May 8, 2014. The well is a unit obligation well for the Found Soldier Unit on federal oil and gas lease WYW-131797. IPEOC proposes to vertically drill a gas production well to a depth of 14,500 feet, approximately 10 miles southeast of Jeffrey City, Wyoming. The project would require construction of a 4.4-acre well pad and removal of approximately 300 immature lodgepole pines. In addition, 2.6 miles of existing access road would be upgraded and 2,000 feet of new access road would be built. It is estimated that the well pad and associated access road would result in a potential maximum initial surface disturbance of approximately 14 acres. Short-term impacts to surface resources from the proposed project are expected to last 3 to 5 years. If the well goes into production, and after interim reclamation, long-term impacts to approximately 9.5 acres of surface resources would remain for the operating life of the well (more than 20 years). There is the potential for additional wells to be drilled in the future but this would depend on the success of this unit obligation well. There are no additional wells proposed at this time.

Atlantic Rim Natural Gas Field Development Project. In 2007, the BLM authorized 2,000 in-fill wells (1,800 coal-bed methane and 200 conventional natural gas wells) in the currently producing Atlantic Rim Natural Gas Field south of Rawlins and north of Baggs in Carbon County. The project includes the construction of supporting infrastructure, including access roads, pipelines, and ancillary facilities. Drilling is expected to require approximately 20 years and the project's productive life is expected to extend an estimated 30 to 50 years beyond construction, for a combined total project life of 50 to 70 years.

Continental-Divide-Creston Natural Gas Development Project. The CD-C Project Area encompasses approximately 1.1 million acres (1,672 square miles) in an existing gas-producing area located west of Rawlins, Wyoming in Carbon and Sweetwater counties. Total new surface disturbance would be approximately 47,300 acres or 4.4 percent of the CD-C Project Area.

The CD-C Project is an in-fill project with more than 4,400 existing oil and gas wells. The proposed project includes the development of an additional 8,950 gas wells, including construction of supporting infrastructure - access roads, pipelines, electrical power lines, a central gas processing plant, and water management and disposal facilities. Construction would require approximately 15 years and the productive life of the project would extend an estimated 30 to 40 years beyond construction, for a combined total project life of 45 to 55 years.

West Bison Basin Unit Secondary Oil Recovery Project. The project proposal is to implement a nine-well steam injection program in the West Bison Basin Unit for secondary oil recovery (SOR) of an existing oil field. The West Bison Basin SOR Project proposes to inject steam into the oil bearing zones to increase the amount of recoverable oil and gas compared to the current primary recovery of this aging oil field.

It is estimated that the nine new well pads and associated access roads, pipelines, and all other new project disturbance would result in a potential maximum initial surface disturbance of approximately 20 acres. Short-term impacts to surface resources from the proposed project are expected to last 3 to 5 years. All areas of new disturbance not needed for the duration of project operations will be reclaimed per BLM specifications. Long-term surface disturbance resulting from the proposed project is estimated to be approximately 10 acres. The anticipated duration of the proposed project is approximately 20 years.

Proposed Rights-of-Way within the RMP Designated Corridor. The Lander RMP and Final EIS (2013a) includes a designated corridor for ROWs such as pipelines, power lines, and fiber optic lines that travel through Crooks Gap and are within several of the CIAAs for individual resources. The corridor is identified as a 0.5-mile wide corridor that could allow for numerous ROWs with varying widths. ROWs proposed within the LFO would be required to be within this corridor or provide reasonable justification as to why it is not possible to fall within this corridor. At this time, two proposed projects fall within this corridor: the Denbury Riley Ridge CO_2 Pipeline and the Moneta to Rawlins Gas Pipeline. For analysis purposes, each of these pipelines could disturb a 65-foot wide swath along the length of the corridor during construction. In order to accommodate a conservative analysis for projects within the ROW, it is assumed that ROWs will disturb a total width of 300 feet within this corridor. Disturbance for ROWs outside of the LFO but within individual resource CIAAs is estimated based on the most likely route for such ROWs that may or may not be within a designated corridor.

5.4 CUMULATIVE EFFECTS

Surface disturbance estimates for the mining and oil and gas projects within each CIAA are summarized in Table 5.4-1. Because the cumulative effects analyses associated with Socioeconomics, Environmental Justice, and Transportation/Access assess the use of and impacts on existing financial and physical infrastructure, rather than surface disturbance, the CIAA of Carbon, Fremont, and Sweetwater counties is not included in Table 5.4-1. A cumulative analysis by resource follows.

Table 5.4-1
Summary of Cumulative Surface Disturbance

CIAA	Total CIAA Area (acres)	Previously Disturbed Area within Project Area (acres) [1]	Past and Present Actions (acres)		RFFAs (acres)	Proposed Action (acres)	Total Disturbance (acres) (percent of CIAA)
			Mining [2, 3]	Oil & Gas [4]			
Project Area (Soils, Water Use, Vegetation, Special Status Plants, Paleontological Resources, Public Health and Safety)	3,611	740	0	0	0	929	1,669 (46%)
Project Area and 1-mi buffer (Wetlands/Riparian, Wildlife, Other Sensitive Species)	12,497		237	117	305		2,328 (19%)
Project Area and 5-mi buffer (Recreation)	86,585		1,576	523	1,105		4,873 (6%)
Project Area and 10-mi buffer (Geology, Minerals, Special Status Wildlife Species)	269,423		6,229	978	2,064		10,940 (4%)
Project Area and 15-mi buffer (Cultural, Tribal, Groundwater)	552,697		18,046	1,173	3,153		24,041 (4%)
Greater Sage-Grouse, Invasive Species	398,621		19,863	1,101	2,355		24,988 (6%)
Surface Water and Fisheries	94,505		4,476	463	1,069		7,677 (8%)
Big Game	1,118,651		32,692	2,289	4,334		40,984 (4%)
Wild Horse and Burros	175,017		66	208	232		2,175 (1%)
Livestock Grazing	39,696		1,118	108	196		3,091 (8%)

Source: 2012 and 2013 BLM GIS shapefiles.
[1] Includes 185 acres associated with the WDEQ-AML 16-O Project.
[2] Includes Cole-Red Desert Pit, Sweetwater Mill, and disturbance associated with the Split Rock Mill (does not include the DOE Long-Term Care Boundary which would be an additional 3,046 acres).
[3] To avoid double counting, historical mining acres within the Project Area and Proposed Action/BLM Mitigation Alternative disturbance footprint were not included.
[4] The acres represent 15 percent of the entire field to be developed for oil and gas.

5.4.1 Air Quality

5.4.1.1 Introduction

The CD-C Project FEIS (BLM, 2016c) is used for addressing cumulative impacts for the Sheep Mountain cumulative air quality and AQRV assessment, including regional ozone formation. For the CD-C impact analysis, the CAMx (Comprehensive Air quality Model with Extensions; ENVIRON, 2010) photochemical grid model (PGM) was used to predict maximum potential regional-wide ambient air quality and AQRV impacts at federal PSD Class I and other sensitive PSD Class II areas, as well as designated acid-sensitive lakes. The CD-C Project analysis included a regional air quality assessment (including ozone) and AQRV analysis for southwest Wyoming including the region surrounding the Sheep Mountain Project Area. The analyses were performed using the CAMx model and two years of meteorological data, years 2005 and 2006. The CD-C analysis analyzed regional impacts for a base case year 2008 and for future year 2022.

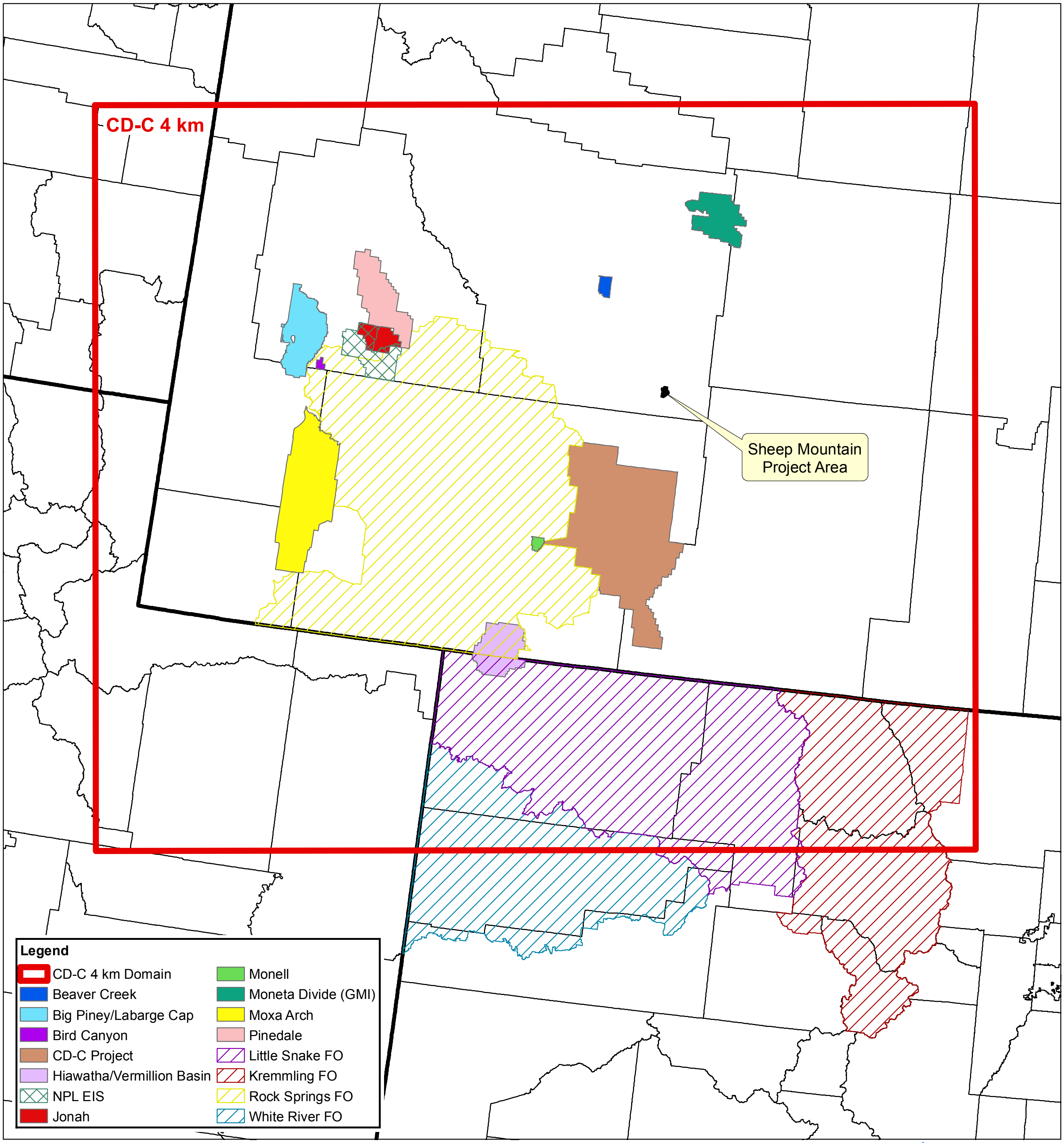
The CD-C analysis included impact assessments at 12 PSD Class I and sensitive Class II areas, and at 19 sensitive lakes throughout the CD-C Project modeling domain, which included all of Class I and Class II areas and lakes that have been included in the Sheep Mountain Project Calpuff impacts analyses, with the exception of the Washakie Class I Wilderness Area. For the Sheep Mountain Uranium Project cumulative assessment, the CD-C Project cumulative impacts are presented for each of the PSD Class I and sensitive Class II areas and for lakes that were analyzed for project-specific impacts and are described earlier in Section 4.2.1.

5.4.1.2 Regional Emissions

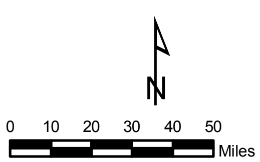
<u>RFD Emissions</u>

The CD-C cumulative assessment included maximum emissions from reasonably foreseeable development (RFD) sources within the study area. RFD is defined as (1) air emissions from the undeveloped portions of authorized NEPA projects and RMPs, and (2) air emissions from not-yet-authorized NEPA projects (if emissions were quantified when modeling commences). A listing of RFD projects and emissions which were included in the study is presented in Table 5.4-2. Map 5.4-1 indicates the locations of each of the RFD projects and Map 5.4-2 illustrates the extents of CD-C modeling domain.

The Sheep Mountain Uranium Project emissions were not directly included as RFD emissions in the CD-C modeling analysis. However, as shown in Table 5.4-2, the CD-C Project cumulative analyses included emissions for the Beaver Creek Coalbed Natural Gas and Conventional Oil and Gas Development Project EIS. The Beaver Creek Project Area is located in Fremont County, approximately 35 miles to the northwest of the Sheep Mountain Project Area. The Beaver Creek Project has been terminated and the emissions included in the CD-C cumulative modeling results are comparable to the level of the emissions from the Sheep Mountain Uranium Project. The Sheep Mountain Uranium Project Year 3 emissions, for the production with off-site processing scenario, are 201.1 tpy of NO_x, 57.4 tpy of VOC, 0.9 tpy of SO_2, 255.5 tpy of PM_{10}, and 41.1 tpy of $PM_{2.5}$.



Map 5.4-1
RFD Project Areas



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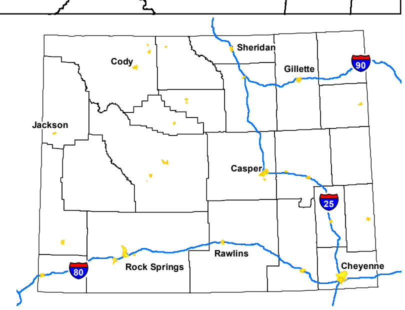
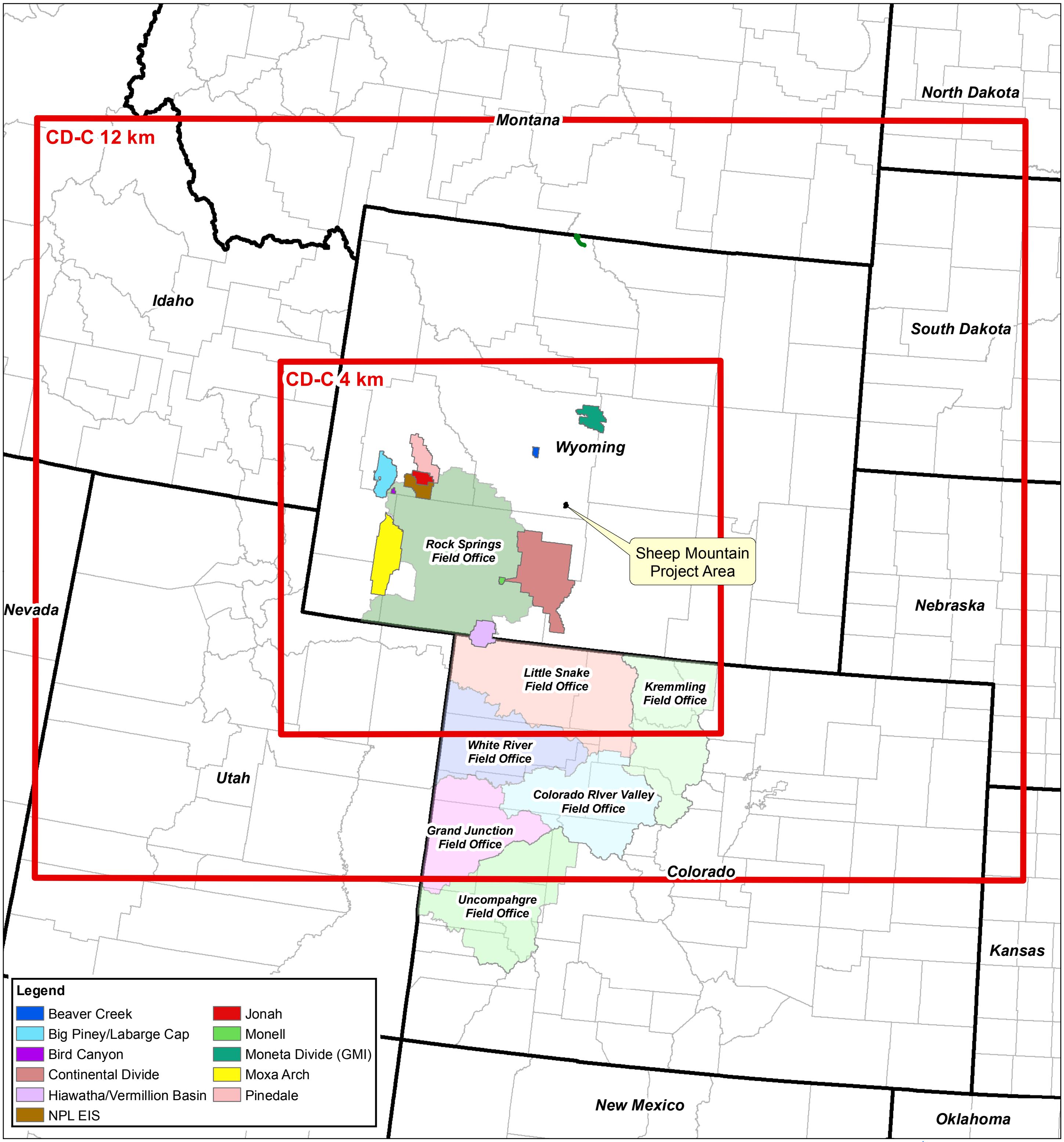
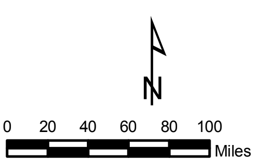




Map 5.4-2
CD-C Project 4/12 km domain



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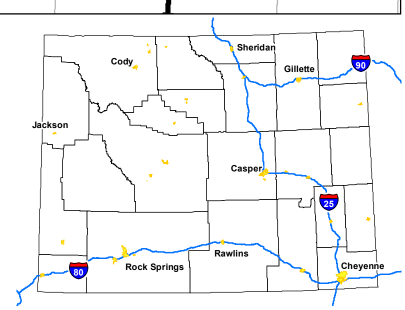

Table 5.4-2
RFD Emissions within the CD-C Project Study Area

RFD Project	Inventory Year	Emissions (tpy)					
		NO_x	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$
CD-C - Proposed Action	2022	4,742	14,716	8,588	2	2,235	455
CD-C – Existing Wells	2022	1,757	42,249	1,852	2	449	153
Beaver Creek	2016	105	85	103	0	89	14
LaBarge Platform	2027	676	1,534	383	96	110	36
NPL	2022	472	310	623	10	968	145
Monell Arch	2021	253	276	220	8	33	17
Moneta Divide	2018	1,035	3,662	364	0	1,108	140
Rock Springs Field Office	2031	998	3,318	2,369	1	516	93
Little Snake Field Office - Alt B (Preferred)	2021	559	2,712	1,103	3	378	55
Kremmling Field Office - Alt. C (Preferred)	2028	738	5,914	191	3	2,473	408
White River Field Office	2021	3,320	8,564	7,054	20	1,037	198
Colorado River Valley Field Office	2021	2,287	9,240	4,525	8	916	155
Grand Junction Field Office - Alt B (Preferred)	2018	3,373	2,686	4,160	135	2,397	525
Uncompahgre Field Office - Alt. D (Preferred)	2028	3,271	2,498	3,327	138	1,118	494
Bird Canyon	2020	658	641	481	5	250	64
Moxa Arch Existing Wells	2018	1,550	19,596	1,178	1	232	79
Moxa Arch Proposed Action New Wells	2018	1,186	1,647	1,776	0	583	124
Moxa Arch Proposed Action ROD Wells	2018	64	166	128	0	30	6
Hiawatha Existing Wells (CO &WY)	2017	318	4,136	352	0	41	9
Hiawatha Proposed Action New Wells (CO & WY)	2017	1,555	919	1,861	1	318	100
Pinedale	*	1,381	2,286	1,250	53	53	79
Jonah	2008	1,099	2,705	686	62	62	28
	Total	**31,397**	**129,860**	**42,574**	**548**	**15,396**	**3,377**
*Based on the Pinedale Supplemental EIS Alternative C Phase II emissions levels.							

Table 5.4-2 also indicates the project year inventoried for each RFD project when maximum emissions are expected to occur. Full development of proposed projects inventoried as RFD may or may not coincide with full development of the Sheep Mountain Uranium Project. As a result, the assumption that all RFD are fully developed during the maximum year of the Sheep Mountain Uranium Project development results in conservatism in the cumulative impact analysis.

<u>Other Regional Emissions</u>

Regional emissions inventories for all other source type categories were quantified for the entire study area shown in Map 5.4-1. Emissions of CO, NO_x, SO_2, PM_{10}, and $PM_{2.5}$, and VOC were inventoried for both the 2008 baseline year and for year 2022. A complete discussion of the emissions inventories included in the cumulative study is reported in Section 2 of the CD-C Project AQTSD (BLM, 2016b).

5.4.1.3 Cumulative Impacts

5.4.1.3.1 Criteria Pollutants Impacts

The CD-C cumulative modeling analysis estimated potential impacts to ambient air concentrations from air pollutant emissions of NO_x, SO_2, PM_{10}, $PM_{2.5}$, VOCs, and CO expected to result from RFD sources emissions and other cumulative (regional) emissions sources. The estimated impacts in the vicinity of the Sheep Mountain Uranium Project Area are discussed below.

<u>Regional Ozone Impacts</u>

The CD-C analysis included estimates of future year regional ozone impacts using two analysis methods. One method uses the change in the PGM modeled concentrations between base case or current year (DVC) (year 2008) and future year (DVF) (year 2022) simulations to scale observed ozone concentrations from monitoring sites to obtain projected future year ozone concentrations. This method utilized EPA's Modeled Attainment Test Software (MATS) (Abt Associates, Inc., 2012) projection tool with the CAMx 2008 Base Case and 2022 scenario ozone concentrations to estimate ozone impacts. The second method uses the absolute modeling results from the CAMx model to estimate ozone impacts. Two years of meteorology (2005 and 2006) were modeled with CAMx.

The CAMx predicted current year DVCs indicate areas where ozone concentrations approach the NAAQS (70 ppb) in the vicinity of the Sheep Mountain Project Area in 2008 with the concentrations slightly decreasing in year 2022. The estimated ozone concentrations using absolute CAMx model results indicates ozone concentrations in the vicinity of the Sheep Mountain Project Area that are above the 70 ppb NAAQS for both the base year 2008 and future year 2022 for the meteorology year 2006 simulation. The estimated absolute model ozone concentrations approach 75 ppb in year 2008 and decrease slightly to near 72.5 ppb in 2022 in the vicinity of the Project Area. The 2-year average of the absolute model ozone concentrations are below the 70 ppb NAAQS for these areas. Given that the maximum future year emissions from the Sheep Mountain Uranium Project sources include 201.1 tpy of NO_x and 57.4 tpy of VOC, the contribution to regional ozone impacts from Sheep Mountain Uranium Project sources would likely be minimal. A detailed discussion of the ozone analysis is provided in Section 4.5.4 of the CD-C AQTSD (BLM, 2016b).

Note that on October 1, 2015, the EPA lowered the ozone NAAQS from 75 ppb (established in 2008) to a more stringent value of 70 ppb (EPA, 2015). The EPA expects to issue detailed guidance on the designation process in early 2016, but has indicated that attainment designations for the 2015 NAAQS will be based on 2014-2016 data. State recommendations for designations of attainment and nonattainment areas are due to EPA by October 1, 2016 and EPA has a statutory obligation to finalize designations by October 1, 2017. Therefore, at the time of writing of this document, the attainment status of the Project Area and all Wyoming counties under the 2015 NAAQS is not yet known and the designations under the 2008 NAAQS remain in place.

Regional NO_2, SO_2, CO, PM_{10}, and $PM_{2.5}$ Impacts

The results of the cumulative modeling showed that NO_2, SO_2, CO, PM_{10}, and $PM_{2.5}$ concentrations in the vicinity of the Sheep Mountain Uranium Project Area would be well below the applicable NAAQS and WAAQS. Additional detail on the modeling results are provided in Section 4.5.3 of the CD-C AQTSD (BLM, 2016b).

5.4.1.3.2 Visibility Impacts

The cumulative visibility analysis follows the approach that was developed by the FWS and the NPS and was documented in a letter sent on February 10, 2012 to the WDEQ-AQD. The approach uses the two EPA Regional Haze Rule (RHR) metrics goals:

- Improvement in visibility for the 20 percent worst visibility days
- No worsening in visibility for the 20 percent best visibility days

Although the cumulative visibility approach uses the RHR metrics, the cumulative visibility analysis for the regional emissions sources is not comparable to a states RHR State Implementation Plan (SIP) analysis because different basic assumptions are used in the analysis, such as different future emissions years, different emissions projections and different observed visibility baseline years.

The CAMx 2008 and 2022 model outputs were used to project the observed visibility conditions from all cumulative emissions, including RFD sources, at IMPROVE sites within the 4 km domain from the baseline period (2006-2010) to 2022 for the worst 20 percent and best 20 percent days, using the EPA's MATS tool. 2022 visibility projections for the worst 20 percent and best 20 percent days were also made without the RFD sources. This allows an assessment of the effects of emissions from the RFD emissions on the RHR visibility metrics.

Tables 5.4-3 through 5.4-6 indicate improved visibility in 2022 compared to the 2006 – 2010 baseline years at all the Class I and Class II areas for both the best and worst 20 percent days. Impacts from RFD sources on 2022 haze are estimated to vary between 0.03 dv and 0.16 dv among the Class I and Class II areas.

Table 5.4-3
Cumulative Visibility Results for Best 20 Percent Days - Using 2005 Meteorology

Best 20 Percent Days - 2005 Meteorology				
Class I or Class II Area	**Baseline Visibility (2006-2010) (dv)**	**Cumulative and RFD sources (Cumulative 2022 Visibility) (dv)**	**No RFD Sources (Cumulative 2022 Visibility) (dv)**	**Difference Between Cumulative and RFD Sources and No RFD Sources (dv)**
Bridger Wilderness Area	1.39	1.17	1.14	0.03
Fitzpatrick Wilderness Area	1.39	1.19	1.16	0.03
Mount Zirkel Wilderness Area	0.95	0.74	0.66	0.08
Popo Agie Wilderness Area	1.39	1.28	1.15	0.13
Savage Run Wilderness Area	0.95	0.62	0.49	0.13
Wind River Roadless Area	1.39	1.17	1.13	0.04

Table 5.4-4
Cumulative Visibility Results for Worst 20 Percent Days - Using 2005 Meteorology

Worst 20 Percent Days - 2005 Meteorology				
Class I or Class II Area	**Baseline Visibility (2006-2010) (dv)**	**Baseline Visibility (2006-2010) (dv)**	**Cumulative and RFD sources (Cumulative 2022 Visibility) (dv)**	**No RFD Sources (Cumulative 2022 Visibility) (dv)**
Bridger Wilderness Area	10.58	10.28	10.23	0.05
Fitzpatrick Wilderness Area	10.58	10.27	10.24	0.03
Mount Zirkel Wilderness Area	9.36	9.09	9.01	0.08
Popo Agie Wilderness Area	10.58	10.45	10.29	0.16
Savage Run Wilderness Area	9.36	8.97	8.83	0.14
Wind River Roadless Area	10.58	10.26	10.21	0.05

Table 5.4-5
Cumulative Visibility Results for Best 20 Percent Days - Using 2006 Meteorology

Best 20% Days - 2006 Meteorology				
Class I or Class II Area	**Baseline Visibility (2006-2010) (dv)**	**Baseline Visibility (2006-2010) (dv)**	**Cumulative and RFD sources (Cumulative 2022 Visibility) (dv)**	**No RFD Sources (Cumulative 2022 Visibility) (dv)**
Bridger Wilderness Area	1.39	1.22	1.19	0.03
Fitzpatrick Wilderness Area	1.39	1.24	1.22	0.02
Mount Zirkel Wilderness Area	0.95	0.75	0.67	0.08
Popo Agie Wilderness Area	1.39	1.34	1.21	0.13
Savage Run Wilderness Area	0.95	0.66	0.53	0.13
Wind River Roadless Area	1.39	1.21	1.17	0.04

Table 5.4-6
Cumulative Visibility Results for Worst 20 Percent Days - Using 2006 Meteorology

Worst 20 Percent Days - 2006 Meteorology				
Class I or Class II Area	**Baseline Visibility (2006-2010) (dv)**	**Baseline Visibility (2006-2010) (dv)**	**Cumulative and RFD sources (Cumulative 2022 Visibility) (dv)**	**No RFD Sources (Cumulative 2022 Visibility) (dv)**
Bridger Wilderness Area	10.58	10.30	10.28	0.02
Fitzpatrick Wilderness Area	10.58	10.32	10.31	0.01
Mount Zirkel Wilderness Area	9.36	9.16	9.05	0.11
Popo Agie Wilderness Area	10.58	10.56	10.40	0.16
Savage Run Wilderness Area	9.36	9.01	8.83	0.18
Wind River Roadless Area	10.58	10.27	10.24	0.03

5.4.1.3.3 Atmospheric Deposition Impacts

Modeled wet and dry fluxes of sulfur (S) and nitrogen (N) due to emissions from the cumulative sources were processed to estimate total annual S and N deposition values at each PSD Class I and sensitive PSD Class II area.

Table 5.4-7 shows maximum predicted total N and S deposition impacts from all emission sources for the year 2022 from either of the 2005 and 2006 meteorology data sets. Estimated cumulative N deposition impacts at all Class I and sensitive Class II areas within the study area would be above the critical load thresholds. Estimated S deposition impacts would be below the 5.0 kg/ha-yr threshold at all areas.

Table 5.4-7
Cumulative Nitrogen and Sulfur Deposition Impacts

Class I or Sensitive Class II Area	Nitrogen Deposition (kg/ha-yr)	Nitrogen Critical Load (kg/ha-yr)	Sulfur Deposition (kg/ha-yr)	Sulfur Critical Load (kg/ha-yr)
Bridger Wilderness Area	2.85	2.2	1.61	5.0
Fitzpatrick Wilderness Area	3.17	2.2	1.66	5.0
Mount Zirkel Wilderness Area	5.40	2.3	3.25	5.0
Popo Agie Wilderness Area	3.62	2.2	1.95	5.0
Savage Run Wilderness Area	2.67	2.2	1.24	5.0
Wind River Roadless Area	3.49	2.2	2.04	5.0

Table 5.4-8 shows the 2022–2008 change in maximum N and S deposition at all Class I/II areas from either of the 2005 and 2006 meteorology data sets. The modeling results indicate that cumulative N and S deposition impacts in 2022 would decrease in all Class I/II areas relative to year 2008. The decrease in N deposition is due to various regulatory programs that will reduce NO_x emissions in 2022 compared to 2008.

Table 5.4-8
2022-2008 Change in Cumulative Nitrogen and Sulfur Deposition

Class I or Sensitive Class II Area	Nitrogen Deposition		Sulfur Deposition	
	Deposition (kg/ha-yr)	**Percent Change**	**Deposition (kg/ha-yr)**	**Percent Change**
Bridger Wilderness Area	-0.3221	-10.54	-0.2726	-14.51
Fitzpatrick Wilderness Area	-0.3118	--8.97	-0.1755	-12.95
Mount Zirkel Wilderness Area	-0.6458	-10.69	-0.3921	-10.77
Popo Agie Wilderness Area	-0.3619	-9.08	-0.2254	-16.57
Savage Run Wilderness Area	-0.2901	-9.81	-0.1355	-9.84
Wind River Roadless Area	-0.3039	-8.00	-0.1439	-6.58

<u>Acid Neutralizing Capacity of Sensitive Lakes</u>

Modeling results for cumulative sources indicated that there would be no ANC changes at any of the eight lakes that exceed the 10-percent threshold or the ΔANC<1 µeq/l threshold for the two extremely sensitive lakes. In addition, the cumulative assessment shows that N and S deposition into the sensitive lakes in 2022 would be lower than in 2008 due to regional emissions reductions. This potentially results in an increase in ANC of the sensitive lakes over this time frame, with the lakes becoming more resilient to acid deposition in future years than during the baseline period.

5.4.1.3.4 Climate Change Impacts

As discussed in Section 3.2.1, the current scientific consensus is that anthropogenic emissions of GHGs are causing the global climate system to warm, and the amount of GHGs emitted globally will determine the magnitude of climate change throughout this century (NCA, 2014a). Forecasts of changes in the climate system under different GHG emissions scenarios are made with global climate models. In Wyoming, the number of hot days and warms nights is predicted to increase leading to "increased demand for water and energy and impacts on agricultural practices" (NCA, 2014b). Analyzing these potential effects (i.e., to water, vegetation, wildlife, etc.) as a result of climate change would be too speculative for the purposes of this analysis.

The GHGs to be emitted by the Project sources and cumulative sources in the study area are CO_2, CH_4, and N_2O, all of which have atmospheric lifetimes on the order of years. Emissions of GHGs from any particular source become well-mixed throughout the global atmosphere. GHG emissions from all sources contribute to the global atmospheric burden of GHGs, and it is not possible to attribute a particular climate impact in any given region to GHG emissions from a particular source. Therefore, no modeled climate change impact predictions from cumulative GHG emissions sources in the vicinity of the Project Area are available.

5.4.2 Geologic Resources

The CIAA for geologic resources, which encompasses 269,423 acres (see Table 5.4-1) includes the Project Area plus a 10-mile buffer (see Map 5.2-3 and Table 5.2-1). Impacts to geologic resources such as ore removal and changes to physiography and topography are inherent impacts associated with mining that occur within the CIAA as a result of any of the action alternatives and RFFAs. Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 6,229 acres and 978 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 2,064 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When the past, present, and reasonably foreseeable actions are added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 10,940 acres, which is 4 percent of the CIAA.

Project design measures for the action alternatives, as well as for the past and present actions and RFFAs, would be applied to prevent or minimize effects from slope instability, subsidence, seismic hazards, and chemical hazards; therefore, cumulative effects from geologic hazards would be expected to be minimal.

5.4.3 Mineral Resources

The CIAA for mineral resources and the estimated surface disturbance is the same as that for geologic resources (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Cumulative effects would be limited to the indirect effects associated with the potential development of mineral material sales (sand and gravel) needed for project development. Because mineral resources are relatively limited in and near the Project Area and there are no identified conflicts with development of other mineral resources within the Project Area, effects to mineral resources would be minimal; therefore cumulative effects would be minimal. The indirect impacts created by the increased demand for mineral resources such as sand and gravel or other construction material as a result of the action alternatives to the other mineral users identified as past and present actions or RFFAs would result in cumulative impacts to those minerals. These impacts would be minor considering the action alternatives would generate mineral materials on-site for which there is no competition.

5.4.4 Soils

The CIAA for soils is the Project Area (see Tables 5.2-1 and 5.4-1), which includes 3,611 acres. Within the Project Area, the Proposed Action/BLM Mitigation Alternative would disturb a maximum of 929 acres (26 percent). Of the 3,611 acres, but excluding the Proposed Action/BLM Mitigation Alternative, 740 acres have been previously disturbed, some of which have been reclaimed. Total cumulative disturbance (past and proposed) would equal 1,669 acres or 46 percent of the CIAA. WDEQ-AML's Project 16-O for reclamation of McIntosh Pit would be a beneficial effect to soils in that part of the Project Area. Upon completion of the Project and following successful reclamation of the action alternatives, cumulative effects to soils within the Project Area may include recreational activities (i.e., hunting and OHV use).

5.4.5 Water (Surface Water, Groundwater, and Water Use)

Surface Water. The CIAA for surface water is the Crooks Creek sub-watershed including Sheep Creek, which totals about 94,505 acres (see Map 5.2-2 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within this CIAA is estimated to be 4,476 and 463 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 1,069 acres and includes the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When added to the Proposed Action/BLM Mitigation Alternative effects (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 7,677 acres, which is 8 percent of the CIAA.

In Chapter 4, effects from the Proposed Action/BLM Mitigation Alternative to surface water features in the vicinity of the Project were determined to be minimal and would be monitored to confirm this determination, especially considering surface discharge would occur in compliance with conditions of the WYPDES Permit (WDEQ, 2015b). Surface disturbance associated with past and present actions and RFFAs may result in adverse impacts to surface water similar to those described in Section 4.2.5, Water Resources. These impacts could include temporary increases in stormwater runoff and increases in suspended and dissolved solid concentrations in runoff during ground disturbance. However, each new project disturbing more than 1 acre would be required to obtain a construction stormwater discharge permit and to prepare and adhere to an approved SWPPP. Once successful reclamation of disturbed ground is complete, the effects to surface water resources would be expected to be minimal. With implementation of appropriate BMPs and adherence to required water quality permits and approvals under all action alternatives, the cumulative effects should be minimal.

Groundwater. The CIAA for groundwater is the Project Area plus a 15-mile buffer, which equals 552,697 acres (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). The CIAA includes portions of two separate groundwater basins; the Great Divide Basin and the Sweetwater River Drainage. Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 18,046 and 1,173 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 3,153 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration, the proposed expansion of the Lost Creek ISR Uranium Mine, and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. Including the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance is estimated to be 24,041 acres, which is 4 percent of the CIAA.

As described in Chapter 4, groundwater impacts from the Proposed Action/BLM Mitigation Alternative were determined to be limited to the vicinity of the Project (in the Great Divide Basin). Groundwater levels within the Project Area would be drawn down during dewatering but would recover and would be monitored throughout the Project to confirm this assessment. Water quality impacts would be limited and would also be monitored. Water quantity and quality effects from all RFFAs should be avoided and/or minimized by adherence to the required permits and approvals required for each project and by on-going or proposed reclamation. For example, the WDEQ-AML Project 16-0 would reduce evaporative losses of groundwater and restore the flow-through drainage by backfilling McIntosh Pit. Cumulative effects would occur but, relative to the quantity of groundwater within the 15-mile buffer area, the amount of groundwater affected would be minimal.

Water Use. Effects, other than those associated with mining, would not be anticipated from the Proposed Action/BLM Mitigation Alternative; therefore, there would be no cumulative effects.

5.4.6 Invasive, Non-Native Species

The CIAA for invasive, non-native species includes the Project Area plus a 10-mile buffer as well as the travel route to the Sweetwater Mill and a 5-mile buffer around the route and the mill, which totals 398,621 acres (see Map 5.2-2 and Tables 5.2-1 and 5.4-1). Cumulative effects increasing the populations of invasive, non-native species would mainly be associated with traffic from the Project Area added to all other traffic using the same route between the Project Area and the Sweetwater Mill. Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 19,863 and 1,101 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 2,355 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When the past, present, and reasonably foreseeable actions are added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 24,988 acres, which is 6 percent of the CIAA. Following successful reclamation, including monitoring, of the action alternatives and assuming weed control BMPs would be required for the RFFAs, cumulative effects from invasive species, considering other expected activities within the Project Area such as recreation (i.e., hunting and OHV use), would occur but would be minimized.

5.4.7 Vegetation

The CIAA for vegetation is the Project Area (see Tables 5.2-1 and 5.4-1), which includes 3,611 acres. Within the Project Area, the Proposed Action/BLM Mitigation Alternative would disturb a maximum of 929 acres (26 percent). Of the 3,611 acres, but excluding the Proposed Action/BLM Mitigation Alternative, 740 acres have been previously disturbed, some of which have been reclaimed. Total cumulative disturbance (past plus proposed) would equal 1,669 acres or 46 percent of the CIAA. One objective of WDEQ-AML's 16-O Project for reclamation of McIntosh Pit would be to promote vegetative success and diversity in that part of the Project Area. Following successful reclamation of the action alternatives, including weed control and monitoring, cumulative effects to vegetation, considering other expected activities within the Project Area such as recreation (i.e., hunting and OHV use), would occur but would be minimized in this historically disturbed area.

5.4.8 Wetlands and Riparian Zones

The CIAA for wetlands and riparian zones is the Project Area plus a 1-mile buffer, which totals 12,497 acres (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). In 2014, field surveys located one wetland (0.2 acre) within the Project Area, and NWI data show approximately 48 wetlands (35 acres) outside the Project Area but within the 1-mile buffer. The Project would not affect wetlands and it is not anticipated that the RFFAs would affect wetlands. Any effects from the action alternatives and from RFFAs to wetlands or riparian zones would be regulated by the USACE.

5.4.9 Special Status Species

Plants. The CIAA for special status plant species is the Project Area (see Section 5.4.7). Except for limber pine, the action alternatives would not affect special status plant species and, therefore, no cumulative effects would occur. Cumulative effects to limber pine would include the action alternative effects described in Chapter 4 (Section 4.3.4) and the effects proposed by WDEQ-AML Project 16-O for reclamation of McIntosh Pit.

Wildlife. The CIAA for special status wildlife species (except greater sage-grouse), which encompasses 269,423 acres, includes the Project Area plus a 10-mile buffer (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 6,229 acres and 978 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 2,064 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When the past, present, and reasonably foreseeable actions are added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 10,940 acres, which is 4 percent of the CIAA. Cumulative effects would be the same as those described in Section 5.4.10 for Wildlife.

Greater Sage-Grouse. The CIAA for greater sage-grouse, which encompasses 398,621 acres, includes the Project Area plus a 10-mile buffer as well as the travel route to the Sweetwater Mill and a 5-mile buffer around the route and the mill (see Map 5.2-2 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 19,863 acres and 1,101 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 2,355 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. The proposed expansion of the Lost Creek ISR Uranium Mine would occur immediately to the east of the CIAA. When the past, present, and reasonably foreseeable actions are added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 24,988 acres, which is 6 percent of the CIAA. Cumulative effects would be the same as those described in Section 5.4.10 for Wildlife, which include decreased habitat due to fragmentation, displacement, decreased reproduction success, increased vehicle collisions, increased hunting pressure, and illegal harvest.

In terms of RFFAs, it should be noted that special status species are generally protected and/or avoided for any activities on public land but may not be protected for actions on private land.

5.4.10 Wildlife

Big Game. The CIAA for big game is a 22-mile buffer around the Project Area that includes portions of the pronghorn Beaver Rim and Red Desert herd units, portions of the Mule Deer Sweetwater Herd Unit, portions of the Elk Green Mountain Herd Unit, and portions of the Moose Lander Herd Unit. The 22-mile buffer also includes the Sweetwater Mill and the travel route to it. The big game CIAA encompasses 1,118,651 acres (see Map 5.2-4 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 32,692 acres and 2,289 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 4,334 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration, the proposed expansion of the Lost Creek ISR Uranium Mine, the West Bison Basin Unit SOR Project, and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When the past, present, and reasonably foreseeable actions are added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 40,984 acres, which is 4 percent of the CIAA.

Raptors. The CIAA for raptors encompasses 269,423 acres and includes the Project Area plus a 10-mile buffer (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 6,229 acres and 978 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 2,064 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When the past, present, and reasonably foreseeable actions are added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance equals 10,940 acres, which is 4 percent of the CIAA.

General Wildlife. The CIAA for wildlife is the Project Area plus a 1-mile buffer, which totals 12,497 acres (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 237 and 117 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 305 acres and includes the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. Including the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), total surface disturbance is estimated to be 2,328 acres, which is 19 percent of the CIAA.

Fisheries. The CIAA for fisheries is the same as surface water (Section 5.4.5). No effects to fisheries from the action alternatives would be anticipated; therefore, cumulative effects would not occur.

Cumulative effects to wildlife would be directly related to habitat loss, habitat fragmentation, animal displacement, and direct mortalities. Because the Project Area is a historical mining site, which has been previously disturbed (with some portions in the process of reclamation), habitat loss and fragmentation have already occurred. Following completion of the Project, the reclaimed areas would be capable of supporting wildlife use.

Cumulative impacts from past and present actions and RFFAs within the CIAA could include:

Reduction of suitable habitat/habitat fragmentation. While surface disturbance generally corresponds to associated wildlife habitat loss, accurate calculations of cumulative wildlife habitat loss cannot be determined because the direct impacts of habitat disturbance are species-specific and dependent upon: 1) the status and condition of the population(s) or individual animals being affected; 2) seasonal timing of the disturbances; 3) value or quality of functional habitat of disturbed sites; 4) physical parameters of the affected and nearby habitats (e.g., extent of topographical relief and vegetative cover); 5) value or quality of functional habitats in adjacent areas; 6) the type of surface disturbance; and 7) other variables that are difficult to quantify (e.g., increased noise and human presence). Historic, current, and future developments in the CIAA have resulted, or would result, in the reduction of carrying capacities as characterized by the amount of available cover, forage, and breeding areas for wildlife species. Current or previous surface disturbance in the CIAA primarily results from mining exploration and reclamation as well as oil and gas development. Other activities such as livestock grazing also contribute to cumulative impacts on wildlife habitat (e.g., reduction of biomass).

Animal displacement. Displaced individuals of any species could be forced into less suitable habitats, possibly resulting in subsequent effects of deteriorated physical condition, reproductive failure, mortality, and general stress as important habitat is reduced and animals are subjected to density-dependent effects. Loss of habitat/forage consequently could result in increased competition between and among species for available resources, increased transmission and susceptibility to disease, increased predation opportunities, and emigration. Some wildlife species, such as raptors, would be susceptible to these cumulative impacts because encroaching human activities in the CIAA have resulted, or would result, in animal displacement in areas that may currently be at their relative carrying capacity for these resident species. Many of the local wildlife populations (e.g., small game, migratory birds) that occur in the CIAAs likely would continue to occupy their respective ranges and breed successfully, although population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Decreased reproduction success. A decrease in reproductive success and physical condition from increased energy expenditure due to physical responses to disturbance could lead to declining population growth.

Increased vehicle/wildlife collisions. An increase in traffic levels on roadways has the potential to increase vehicle/wildlife collisions and increased human utilization of resources through hunting and other recreational activities that would expose wildlife to potential human harassment, either inadvertent or purposeful.

Increased hunting pressure. An increase in human activity in the CIAAs may provide the opportunity for additional hunting pressure on game species such as mule deer, pronghorn, and small game species due primarily to increased public access.

Increased illegal harvest. An increase in human activity in the CIAAs may lead to poaching game species such as mule deer, pronghorn, elk, and small game species due to increased public presence and public access.

5.4.11 Wild Horse and Burros

The CIAA for wild horses totals 175,017 acres (see Map 5.2-4 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 66 and 208 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 232 acres and includes the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. Including the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance is estimated to be 2,175 acres, which is 1 percent of the CIAA. Cumulative effects would include those described in Chapter 4 and Section 5.4.10, above, in addition to the 232 RFFA acres and on-going recreational activities (i.e., hunting and OHV use). Cumulative effects to wild horses would occur but through reclamation of the action alternatives and the RFFAs would not be expected to be significant.

5.4.12 Cultural Resources

The CIAA for cultural resources is the Project Area plus a 15-mile buffer, which equals 552,697 acres (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 18,046 and 1,173 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 3,153 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration, the proposed expansion of the Lost Creek ISR Uranium Mine, and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. Including the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance is estimated to be 24,041 acres, which is 4 percent of the CIAA. As described in Chapter 4, the possibility of discovery of buried cultural features within the Project Area is low. Therefore, cumulative effects would not be expected.

5.4.13 Paleontological Resources

The CIAA for paleontological resources is the Project Area (see Tables 5.2-1 and 5.4-1), which includes 3,611 acres. Within the Project Area, the Proposed Action/BLM Mitigation Alternative would disturb a maximum of 929 acres (26 percent). Of the 3,611 acres, but excluding the Proposed Action/BLM Mitigation Alternative, 740 acres have been previously disturbed, some of which have been reclaimed. Total cumulative disturbance (past plus proposed) would equal 1,669 acres or 46 percent of the CIAA. As stated in Chapter 4, the potential for discovery of paleontological resources within the Project Area is low; therefore, cumulative effects would not be anticipated.

5.4.14 Tribal and Native American Religious Concerns

The CIAA for tribal and Native American Religious Concerns is the Project Area plus a 15-mile buffer, which equals 552,697 acres (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 18,046 and 1,173 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 3,153 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration, the proposed expansion of the Lost Creek ISR Uranium Mine, and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. Including the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), the total cumulative surface disturbance is estimated to be 24,041 acres, which is 4 percent of the CIAA. No areas or sites of tribal or Native American concern have been identified within the Project Area. Concern was expressed about possible effects to the Rawlins to Fort Washakie Road, but the Eastern Shoshone agreed that the Project would cause No Adverse Effect. Cumulative effects would, therefore, not be expected.

5.4.15 Socioeconomics

The CIAA for socioeconomics is Fremont, Carbon, and Sweetwater counties (see Map 5.2-1 and Table 5.2-1). Past and present actions in the area are described in Section 5.3.1. The social and economic effects of past and present actions are reflected in the discussion of affected socioeconomic conditions in Section 3.4.4, and the potential cumulative effects of past and present actions are reflected in the discussion of environmental consequences to socioeconomic conditions in Section 4.4.4.

In addition to the RFFA projects described in Section 5.3.2, the following proposed energy development projects in Fremont and Carbon counties could combine with the Proposed Action/BLM Mitigation Alternative to result in cumulative impacts to socioeconomic conditions:

- **Gas Hills In Situ Recovery (ISR) Uranium Project.** The Gas Hills ISR Project would be located approximately 35 miles north of the Project Area in eastern Fremont County and western Natrona County. In February 2014, the BLM LFO issued a ROD authorizing Power Resources, Inc., doing business as Cameco Resources, to develop the Gas Hills ISR Project, which includes infrastructure development (processing and waste disposal facilities, wells, header houses, roads, power lines, pipelines); construction, operation, and restoration/reclamation of five mine units; and final project reclamation and decommissioning. Direct employment associated with the project is estimated to include between 40 and 92 jobs over a 25-year project life. Total project-related employment is estimated to include an additional 92 indirect and induced jobs per year (BLM, 2013b).
- **Moneta Divide Natural Gas and Oil Development Project.** In January 2013, the BLM LFO initiated the EIS review process for Encana Oil & Gas (USA) Inc. and Burlington Resources Oil & Gas LP's Moneta Divide Project, which would be located approximately 55 miles north of the Project Area, between the communities of Moneta in northeast Fremont County and Hiland in northwest Natrona County (see Map 5.2-1). The proposed project includes developing approximately 4,250 natural gas and oil wells over 10 to 15 years, with an estimated 280 to 300 wells drilled each year. Additional development would include pipelines to transport natural gas from the Moneta Divide gas field to downstream pipelines near Wamsutter. The life of the proposed project is estimated to be 40 years. Employment associated with the project is estimated to include approximately 600 jobs during development and approximately 300 permanent jobs during full field production (BLM, 2013c).
- **Chokecherry/Sierra Madre Wind Energy Project.** Power Company of Wyoming, LLC (PCW) has proposed to construct a 1,000 turbine wind energy generation facility south of Rawlins and Sinclair and north of Saratoga in Carbon County. The BLM Rawlins Field Office issued a ROD authorizing PCW to develop the Chokecherry/Sierra Madre Wind Energy Project in October 2012 and the WDEQ-Industrial Siting Council approved the project in August 2014. Construction of Phase I would include approximately 500 turbines, and is currently expected to begin in late 2014 and continue through 2018. Construction employment associated with Phase I is expected to peak at 945 jobs in the summer of 2017. Construction of Phase II would also include 500 turbines is expected to begin in mid-2019, depending on federal approval processes (WDEQ, 2014). Permanent employment associated with project operations is expected to include between 114 and 158 jobs (BLM, 2011d).

- **Gateway South Transmission Project.** Doing business as Rocky Mountain Power, PacifiCorp has proposed to construct, operate, and maintain approximately 500 miles of overhead transmission line between the Aeolus substation near Medicine Bow in Carbon County and the Clover substation near Mona, in Juab County, Utah. The BLM's Draft EIS, released in February 2014, evaluated alternative transmission line routes through Carbon County, southwest Wyoming, northwest Colorado, and northeast Utah. Transmission line construction would be conducted over 3 years, and is expected to include approximately 610 temporary jobs dispersed across the transmission line route (BLM, 2014e).
- **Gateway West Transmission Line Project.** Rocky Mountain Power and Idaho Power's proposal to develop the Gateway West Transmission Line Project would include constructing approximately 1,000 miles of transmission line between the Windstar substation near Glenrock, in Converse County, and the new Hemingway substation near Boise, Idaho. In November 2013, the BLM issued a ROD authorizing the transmission line to enter Carbon County from the northeast, pass through the Rawlins Area, and continue west into and across Sweetwater County. Construction employment would include between 142 and 186 temporary jobs over an approximate 8 to 27 month construction schedule per segment (BLM, 2011e). At the time this report was written, the project remained in the planning stages and no schedules for transmission line segment construction had been identified (Gateway West, 2014).
- **TransWest Express Transmission Line.** TransWest Express LLC has proposed to develop the TransWest Express Transmission Line, an approximate 725 mile transmission line providing energy produced in Wyoming to markets in California, Nevada, and Arizona. The proposed project includes a northern terminal near Sinclair in Carbon County. In June 2013, the BLM issued a Draft EIS for the project, which has been in development since 2005. Employment associated with constructing the northern terminal is estimated to include 113 direct jobs and 79 secondary jobs, for a total of 192 jobs over a 27 to 28 month construction period. Transmission line construction would include three 200-mile spreads. Employment associated with each spread is estimated to include approximately 140 direct jobs and 62 secondary jobs, for a total of 202 jobs per spread. These jobs would be temporary and dispersed along the transmission line route (BLM, 2013d).

The direct and secondary employment associated with projects planned in the CIAA would be primary drivers of cumulative socioeconomic effects. Among the RFFA projects, relatively low levels of permanent employment would be expected of the Greater Bison Basin Uranium Project, IPEOC Green Mountain Federal #1, and West Bison Basin Unit SOR Project, because these proposals are limited in size and scope. Low levels of permanent employment would also be expected of the Gateway South, Gateway West, and TransWest Express transmission line projects. RFFA projects with anticipated operational workforce levels that could contribute to labor migration into the CIAA include the Chokecherry/Sierra Madre Wind Energy Project (114 to 158 operational jobs) and the CD-C Project, which is estimated to include 1,600 direct jobs and 2,400 indirect and induced jobs in the final years of drilling (Years 14 and 15) (BLM, 2012c). In addition, if, under the Proposed Action/BLM Mitigation Alternative, Sheep Mountain ore was processed off-site, employment in the CIAA would include approximately 55 temporary construction jobs and 120 permanent operational jobs at the Sweetwater Mill.

Combined with the 17 to 189 direct jobs and 5 to 28 indirect and induced jobs associated with the Proposed Action/BLM Mitigation Alternative, the total estimated employment associated with all RFFA projects planned in the CIAA would range from approximately 600 to 2,800 direct jobs and approximately 2,500 indirect and induced jobs. Many of these jobs would be filled locally.

Other jobs would attract non-local workers to the CIAA, some on a temporary basis (construction workers, for example) and some on a permanent basis (operational workers). Cumulative population increases associated with labor migration would be likely to be distributed across communities in Carbon, Fremont, Natrona, and Sweetwater counties, including Casper, Lander, Rawlins, Riverton, Rock Springs, and Wamsutter.

Several of the RFFA projects in the CIAA require regulatory approval to proceed. If approved, the projects planned in the CIAA would provide a long-term stimulus to the region's economy. Cumulative effects would include fiscal impacts to the state and counties through a long-term increase in severance, property, and sales tax revenues. Depending on the timing of project implementation, moderate cumulative effects could include upward pressure on local housing markets, which, in the short-term, would increase housing costs and decrease the availability of short- and long-term rental housing. The extent of pressure on local housing markets would depend on the timing and location of RFFA projects that may be developed in conjunction with the Proposed Action/BLM Mitigation Alternative. Although historic vacancy rates reported by the WHDP indicate the ability of Carbon County to absorb additional renters (see Section 3.4.4.4), this situation would be likely to change if larger projects, such as the CD-C Project, overlapped with the Proposed Action/BLM Mitigation Alternative. The extent of potential labor in-migration associated with RFFA projects compared to the current supply of housing in the CIAA (including 4,867 housing units in Riverton, 3,201 units in Lander, and 3,828 units in Rawlins) indicates the need for additional housing in the CIAA if all RFFA projects are developed concurrently with the Proposed Action/BLM Mitigation Alternative. Potential housing shortages could arise in select locations as local markets responded to a sustained increase in the demand for housing through new construction. Moderate cumulative effects could also include increased demands on emergency response services and law enforcement agencies, particularly the Carbon, Fremont, and Sweetwater county sheriff's offices and the Wyoming Highway Patrol. Although it is uncertain how many proposed projects would be constructed concurrently with the Proposed Action/BLM Mitigation Alternative, construction workforces and schedules associated with present and future cumulative actions and projects may coincide with the Proposed Action/BLM Mitigation Alternative, with moderate effects on housing availability and public services in some local communities, especially in Carbon County.

Indirect impacts to mineral resource development near the Project Area, such as existing and proposed oil and gas operations, could occur through an increase in demand for fuel, equipment, labor, and other products and resources as a result of the Proposed Action/BLM Mitigation Alternative. These indirect impacts could decrease productivity and increase costs of other mineral resource users which would impact the development of mineral resources.

5.4.16 Environmental Justice

The CIAA for environmental justice encompasses Fremont, Carbon, and Sweetwater counties (see Map 5.2-1 and Table 5.2-1). As stated in Chapter 4, the potential direct and indirect effects of the Proposed Action/BLM Mitigation Alternative would not be expected to disproportionately affect minority or low-income populations. Therefore, cumulative effects to environmental justice would not occur.

5.4.17 Transportation/Access

The CIAA for transportation/access is the designated transportation routes within Fremont, Carbon, and Sweetwater counties (see Map 5.2-1 and Table 5.2-1). Based on the analysis in Chapter 4, effects from the Proposed Action/BLM Mitigation Alternative would include increased road deterioration and an increase in maintenance requirements on roads affected by traffic increases, increased vehicular noise, increased dust on unpaved roads, and increased opportunities for vehicular crashes. Cumulatively, all other projects within the three counties would result in the same or similar effects. Effects would not be expected to exceed the capacity of any state highway or county road (i.e., Minerals Exploration or Crooks Gap/Wamsutter) and would not be considered significant.

5.4.18 Public Health and Safety

The CIAA for public health and safety (including waste) is the Project Area and the travel route between the Project Area and the Sweetwater Mill. All waste (solid, hazardous, radioactive) is required to be disposed of in accordance with the applicable laws and regulations. Any unanticipated spills would be handled under an approved spill plan. Transportation of radioactive or hazardous material would also abide by the state and federal requirements. Therefore cumulative effects would not be expected.

The BLM recognizes the NRC's expertise in, and jurisdiction over, the control and proper use of radiological materials. The NRC will analyze and regulate all radiological effects (i.e., the biological pathways through air, water, food ingestion (vegetation, livestock)) associated with the Heap Leach Pad and any potential acid generation after the heap has been spent.

5.4.19 Recreation

The CIAA for recreation is the Project Area plus a 5-mile buffer, totaling 86,585 acres (see Map 5.2-3 and Tables 5.2-1 and 5.4-1). Surface disturbance associated with past and present mining and oil and gas actions within the CIAA is estimated to be 1,576 and 523 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 1,105 acres, which includes the Jab/Antelope Plan of Operations for uranium exploration and the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. Including the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), total surface disturbance is estimated to be 4,873 acres, which is 6 percent of the CIAA. Cumulative effects would be expected to be minimal. While hunting and OHV use may be shifted or restricted from specific areas within the Project Area, they would continue within other parts of the Project Area and the CIAA.

5.4.20 Livestock Grazing

The CIAA for livestock grazing is 39,696 acres. Surface disturbance associated with past and present mining and oil and gas actions is estimated to be 1,118 and 108 acres, respectively. Surface disturbance associated with RFFAs is estimated to be 196 acres and includes the Green Mountain Federal Well #1 for natural gas production as well as the estimated ROW corridor disturbance. When added to the Proposed Action/BLM Mitigation Alternative (929 acres) and the previously disturbed area within the Project Area (740 acres, some of which have been reclaimed), total surface disturbance is estimated to be 3,091 acres, which is 8 percent of the CIAA. One objective of WDEQ-AML's Project 16-O for reclamation of McIntosh Pit would be to promote vegetative success and diversity in that part of the Project Area. Following successful reclamation of the action alternatives, including weed control and monitoring, cumulative effects to forage/vegetation, considering other expected activities within the Project Area such as recreation (i.e., hunting and OHV use), would occur but would be minimized in this historically disturbed area.

CHAPTER 6.0
Consultation and Coordination

6.1 AGENCY PARTICIPATION

Table 1.4-2 in Chapter 1 provides a list of the state agencies, local governments, tribal governments, and other federal agencies with jurisdiction or special expertise for potentially impacted environmental resources associated with the Project. These agencies were extended the opportunity to become Cooperating Agencies for the development of this EIS. Of those agencies, the following requested to participate as cooperators or consulting agencies and will receive a copy of the document.

Federal Agencies

- National Park Service Intermountain Region
- Nuclear Regulatory Commission (Consulting Agency)
- U.S. Environmental Protection Agency, Region 8
- U.S. Fish and Wildlife Service, Ecological Services Field Office

State Agencies

- Office of the Governor
- Game and Fish Department
- Department of Agriculture
- Department of Environmental Quality
- Department of Revenue
- Department of Transportation
- Office of State Lands and Investments
- State Engineer's Office
- State Geological Survey
- State Parks, Historic Sites, and Trails
- Governor's Planning Office
- Office of Tourism Board
- Water Development Office
- Wyoming Business Council
- Wyoming Livestock Board
- Oil and Gas Conservation Commission
- State Historic Preservation Officer
- State Forestry Division

Local Agencies

- Carbon County Commission
- Fremont County Commission
- Sweetwater County Commission

6.2 TRIBAL PARTICIPATION

On September 5, 2012, the BLM and tribal representatives visited the Sheep Mountain Project Area. The purpose of the tour was to show tribal representatives the Project Area and elicit comments about the Project and sites of religious or cultural significance that may be in the area. A total of six tribes (Crow, Eastern Shoshone, Northern Arapaho, Northern Cheyenne, Shoshone-Bannock, and Ute) were contacted via letter, email, and phone calls to see if they wanted to send representatives to the field tour. Of the six tribes, two (Eastern Shoshone and Northern Arapaho) sent representatives to participate in the September 5, 2012 field tour.

No known archaeological sites were located in the Project Area from past surveying, so none were visited during the field tour, but the field tour looked at two nearby sites: the Crooks Gap Stage Station and an intact segment of the Rawlins to Fort Washakie Road.

6.3 SHPO CONSULTATION

The BLM submitted cultural resource inventory reports for formal SHPO review on May 31, 2012, and provided additional information to SHPO on July 10, 2012. On July 17, 2012, SHPO concurred with BLM's finding of No Adverse Effect and agreed that setting was no longer an aspect of integrity for the Rawlins to Fort Washakie Road and Crooks Gap Stage Station in this area. The BLM again consulted with SHPO on December 18, 2013, after additional disturbance areas were identified and inventoried. On January 17, 2014, SHPO determined that the one additional site identified, 48FR7357, was not eligible for inclusion in the NRHP.

6.4 PREPARERS AND REVIEWERS

BLM Interdisciplinary Team

NAME	AREA OF RESPONSIBILITY
Chris Krassin	Project Manager, Soils, Vegetation
Tom Sunderland	Geology, Minerals, Water Resources, Public Health and Safety
Charis Tuers/ Ryan McCammon	Meteorology, Climatology, and Air Quality
Karina Bryan	Cultural Resources, Native American Concerns, Paleontological Resources
Tim Vosburgh	Wildlife, Special Status Species
Jared Oakleaf	Recreation, Transportation
Sarah Wempen	GIS
Tanya Skurski	Vegetation, Special Status Species
Scott Fluer	Wild Horses and Burros
Jeremie Artery	Invasive/Non-Native Species
Melissa Rutledge	Livestock Grazing
Jessica Montag	Socioeconomics, Environmental Justice

Edge Environmental, Inc.

Name	Resource/Responsibility
Mary Bloomstran	Project Manager, Document Control and Review
Carolyn Last	Document Control and Review, Public Heath and Safety
Jim Zapert Susan Connell Craig Little	Air Quality
Dan Duce Nikie Gagnon	Soils, Reclamation
Roberta Hoy	Geology, Minerals, Water Resources
Archie Reeve	Invasives, Vegetation, Wetlands and Riparian Zones, Special Status Species, Wildlife, Wild Horse and Burros
Sandra Goodman	Socioeconomics, Transportation and Access, Environmental Justice
Josh Moro	Cultural Resources, Paleontological Resources, Tribal and Native American Resources, Recreation, Livestock Grazing
Joseph Thomas	GIS

CHAPTER 7.0
REFERENCES

609 Consulting, LLC. 2013. Jeffrey City Water Supply, Level II Feasibility Study, Final Report, Prepared for the Wyoming Water Development Commission. April. Accessed online: http://library.wrds.uwyo.edu/wwdcrept/Jeffrey_City/Jeffrey-City_Water_Supply-Final_Report-2013.html. March 12, 2014.

Abt Associates, Inc. 2012. Modeled Attainment Software, User's Manual. Bethesda, Maryland. October. Accessed online: http://www.epa.gov/ttn/scram/guidance/guide/MATS-2-5-1_manual.pdf.

Adams, R.A. 2003. Bats of the Rocky Mountain West. University of Colorado Press, Boulder, Colorado.

Ambrose, S. and C. Florian. 2014. Sound Levels at Greater Sage-grouse Leks, Pinedale Anticline Project Area, Wyoming. Sandhill Company. May 15.

Amundson, M. 1995. "Home on the Range No More: The Boom and Bust of a Wyoming Uranium Mining Town, 1957 – 1988," Western Historical Quarterly, Volume XXVI, Number 4, (Winter). Utah State University, Logan, Utah.

Andren, H. 1994. Effects of Habitat Fragmentation on Birds and Mammals in Landscapes with Different Proportions of Suitable Habitat - a Review. Oikos 71:355–366.

Avian Power Line Interaction Committee (APLIC). 1994. Mitigating Bird Collisions with Power Lines: The State of the Art in 1994. Edison Electric Institute, Washington, D.C.

Avian Power Line Interaction Committee. 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric Institute, Washington, D.C.

Avian Power Line Interaction Committee. 2014. Developing Power Pole Modification Agreements for Compensatory Eagle Mitigation for Wind Energy Projects: Considerations and Resources for Wind Energy Operators, Electric Utilities, and Agencies when Developing Agreements for Power Pole Modifications as Mitigation for Eagle Take. Washington, D.C. Accessed online: http://www.aplic.org/uploads/files/15523/APLIC%20PPM%20FINAL_June%202014.pdf.

Baron, J. S. 2006. Hindcasting Nitrogen Deposition to Determine and Ecological Critical Load. Ecological Applications, 16(2), 2006, pp 433-439.

Belnap, J., J.H. Kaltenecker, R. Rosentreter, J. Williams, S. Leonard, and D. Eldredge. 2001. Biological Soil Crusts: Ecology and Management. Technical Reference 1730-2. USDI-Bureau of Land Management and U.S, Geological Survey. Denver, Colorado.

Bennett, A.F. 1991. Roads, Roadsides, and Wildlife Conservation: A Review. Pages 99-117 in D.A. Saunders and R.J. Hobbs (editors). Nature Conservation 2: The Role of Corridors. Surrey Beatty & Sons, Chipping Norton, Australia.

Beyer, W.N., J. Dalgarn, S. Dudding, J.B. French, R. Mateo, J. Miesner, L. Sileo, and J. Spann. 2004. Zinc and Lead Poisoning in Wild Birds in the Tri-State Mining District (Oklahoma, Kansas, and Missouri). Archives of Environmental Contamination and Toxicology 48:108-117.

Biltoft, N. 2010. NRCS District Conservationist, Riverton, Wyoming. Personal Communication with J. Mulinix, BKS Environmental Associates. December 15.

BKS Environmental Associates, Inc. (BKS). 2011a. 2010 Baseline Soil Assessment – Sheep Mountain Soil Analysis Area. Submitted to Titan Uranium USA, Inc.

BKS Environmental Associates, Inc. 2011b. Appendix D-8, Titan Uranium USA, Inc., 2011 Baseline Vegetation Assessment Addendum, Sheep Mountain Project Area. Prepared for Titan Uranium USA, Inc.

BKS Environmental Associates, Inc. 2011c. Threatened, Endangered, and BLM Sensitive Plant Species Report For Titan Uranium USA, Inc. – Sheep Mountain Uranium Project. June.

BKS Environmental Associates, Inc. 2013. 2013 Aquatic Resources Inventory, Energy Fuels Resources (USA), Inc., Sheep Mountain Project, Amendment to Wyoming Department of Environmental Quality Permit to Mine No. 381C. Report prepared for Energy Fuels Resources (USA) Inc. December.

BKS Environmental Associates, Inc. 2014a. 2014 Baseline Soil Assessment – Sheep Mountain Project. Prepared for Energy Fuels Resources (USA), Inc. September.

BKS Environmental Associates, Inc. 2014b. 2014 Baseline Vegetation Assessment – Sheep Mountain Project. Prepared for Energy Fuels Resource (USA), Inc. October.

Blackstone, D.L. 1991. Tectonic Relationships of the Southeastern Wind River Range, Southwestern Sweetwater Uplift, and Rawlins Uplift, Wyoming: Geological Survey of Wyoming, Report of Investigations No. 47, Laramie, Wyoming.

Blickley, J.L., D.Blackwood, and G.L. Patricelli. 2012a. Experimental Evidence for the Effects of Chronic Anthropogenic Noise on Abundance of Greater Sage-grouse at Leks. Conservation Biology 26(3):461-471.

Blickley, J.L. K.R. Word, A.H. Krakauer, J.L. Phillips, S.N. Sells, C.C. Taff, J.C. Wingfield, and G.L. Patricell. 2012b. Experimental Chronic Noise is Related to Elevated Fecal Corticosteroid Metabolites in Lekking Male Greater Sage-grouse (*Centrocercus urophasianus*). Plos One 7(11) 1-8. Accessed online: www.plosone.org.

Borchert, W.B. 1977. Preliminary Digital Model of the Arikaree Aquifer in the Sweetwater River Basin, Central Wyoming; U.S. Geological Survey, Water Resources Investigations 77-107, Open File Report, September 1977. Accessed online: http://www.blm.gov/wy/st/en/programs/nlcs/Continental_Divide/watersrc.html.

Borchert, W.B., 1987, Water-Table Contours and Depth to Water in the Southeastern Part of the Sweetwater River Basin, Central Wyoming, 1982. USGS Water-Resources Investigations Report 86-4205.

Braun, C.E. 1986. Changes in Sage Grouse Lek Counts with Advent of Surface Coal Mining. Colorado Division of Wildlife, Research Center.

Brody, C. 2012. Blade Operator, Fremont County Transportation Department. Personal Communication with Edge Environmental, Inc. January 6.

BRS Engineering. 2011. Sheep Mountain Mines Environmental Report (draft). July 19.

BRS Engineering. 2012. Sheep Mountain Uranium Project. Updated Preliminary Feasibility Study National Instrument 43-101 Technical Report. Prepared for Energy Fuels, Inc. April 13.

BRS Engineering. 2014. AML Project 16-O, McIntosh Pit Reclamation Project, Crooks Gap Uranium Mining District, Final Design Report.

Bryan, K. 2013. Bureau of Land Management – Lander Field Office, Range Management Specialist. Personal Communications with K. Yannone, Bureau of Land Management Lander Field Office.

Buffington, P. 2011. Assistant to the Supervisor. Fremont County Transportation Department. Personal Communication with Edge Environmental, Inc. September 23.

Bunting, S.C., B.M. Kilgore, and C.L. Bushey. 1987. Guidelines for Prescribed Burning Sagebrush-Grass Rangelands in the Northern Great Basin. General Technical Report INT-231. USDA-Forest Service, Intermountain Research Station, Ogden, Utah.

Bureau of Economic Analysis (BEA). 2014a. Regional Economic Information System. Full and Part Time Employment Series (CA 25 and CA 25N). Release Date: November 20, 2014. Accessed online: www.bea.gov/regional/index.htm.

Bureau of Economic Analysis. 2014b. Local Area Personal Income and Employment (CA30). Release Date: November 20, 2014. Accessed online: www.bea.gov/regional/index.htm.

Bureau of Labor Statistics (BLS). 2014a. Quarterly Census of Employment and Wages. Accessed online: www.bls.gov/cew/. February 12, 2014.

Bureau of Labor Statistics. 2014b. Local Area Unemployment Statistics. Accessed online: www.bls.gov/data on August 12, 2014.

Bureau of Labor Statistics. 2014c. BLS News Release: Employer Costs for Employee Compensation, December 2013. (USDL-14-0390). March.

Bureau of Labor Statistics, 2014d. BLS Reports. Consumer Expenditures in 2012. Report 1046. March.

Bureau of Land Management (BLM). 1986. Handbook H-8410-1. Visual Resource Inventory.

Bureau of Land Management. 1995. Draft Environmental Impact Statement for the Green Mountain Mining Venture, Jackpot Mine Project, Fremont and Sweetwater Counties, Wyoming. Accessed online: https://archive.org/details/draftenvironment. May.

Bureau of Land Management. 2002. Guidelines for Livestock Grazing Management for Public Lands Administered by the Bureau of Land Management in the State of Wyoming.

Bureau of Land Management. 2007. Notice of Intent to Prepare a Resource Management Plan Revision. U. S. Department of the Interior, BLM, Lander Resource Area, Lander, Wyoming.

Bureau of Land Management. 2008. National Environmental Policy Act Handbook H-1790-1. January.

Bureau of Land Management. 2010. Non-Potable Surface Water Sources: Continental Divide National Scenic Trail.

Bureau of Land Management. 2011a. BLM Instruction Memorandum No. WY-2011-041. Management Guidelines for Whitebark and Limber Pine on the Bureau of Land Management Wyoming Sensitive Species List. August 23.

Bureau of Land Management. 2011b. Green Mountain Common Allotment Proposed Grazing Management - Environmental Assessment WY-050-EA11-5. USDI-Bureau of Land Management Lander Field Office, Lander, Wyoming.

Bureau of Land Management. 2011c. Manual 9113 – Roads. Manual Transmittal Sheet Release 9-390. October 21.

Bureau of Land Management. 2011d. High Desert District/Rawlins Field Office. Chokecherry and Sierra Madre Wind Energy Project. Draft Environmental Impact Statement. Volume II. July. Accessed online: www.blm.gov/wy/st/en/info/NEPA/documents/rfo/Chokecherry.html.

Bureau of Land Management. 2011e. Wyoming State Office. Gateway West Transmission Line Project Draft Environmental Impact Statement. July. Accessed online: www.wy.blm.gov/nepa/cfdocs/gateway_west/documents.html.

Bureau of Land Management. 2012a. Biological Soil Crusts, What are They and a Few Interesting Facts. Soil Biological Communities. National Science and Technology Center. Accessed online: http://www.blm.gov/ns/soil/crusts.

Bureau of Land Management. 2012b, Final Environmental Impact Statement and Record of Decision for the Lost Creek Uranium In-Situ Recovery Project, Sweetwater County, Wyoming, BLM Publication Index Number: BLM/WY/PL-12/019+1330. July.

Bureau of Land Management. 2013a. Final Resource Management Plan and Environmental Impact Statement for the Lander Field Office Planning Area. Wyoming Wind River Bighorn Basin District. U.S. Department of the Interior Bureau of Land Management. Lander, Wyoming.

Bureau of Land Management. 2013b. Final Environmental Impact Statement for the Gas Hills In-Situ Recovery Uranium Project. October 2013. Accessed online: www.blm.gov/wy/st/en/info/NEPA/document/lfo/gashills.html.

Bureau of Land Management, 2013c. Moneta Divide Public Scoping Information. May. Accessed online: www.blm.gov/wy/st/en/info/nepa/documents/lfo/moneta-divide/docs.html.

Bureau of Land Management. 2013d. Wyoming State Office. TransWest Express Transmission Project Draft Environmental Impact Statement. Volume III. June. Accessed online: www.blm.gov/wy/st/en/info/NEPA/documents/hdd/transwest/DEIS.html.

Bureau of Land Management. 2014a. Record of Decision and Approved Resource Management Plan for the Lander Field Office Planning Area. June.

Bureau of Land Management. 2014b. Environmental Assessment for Wyoming Abandoned Mine Land Program Project 16-0 McIntosh Pit Reclamation. Lander Field Office.

Bureau of Land Management. 2014c. Air Resources Technical Report for Oil and Gas Development, New Mexico, Oklahoma, Texas, and Kansas. New Mexico State Office. February.

Bureau of Land Management. 2014d. BLM Wyoming Reclamation Policy. Accessed online: www.blm.gov/wy/st/en/programs/reclamation.html.

Bureau of Land Management. 2014e. Wyoming State Office. Draft Environmental Impact Statement and Land Use Plan Amendments for the Energy Gateway South Transmission Project. Volume 1-A. February. Accessed online: www.blm.gov/wy/st/en/info/NEPA/documents/hdd/gateway_south.html.

Bureau of Land Management. 2015a. Approved Resource Management Plan Amendment for Greater Sage-grouse. Wyoming State Office. September. Accessed online: https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage&currentPageId=18704.

Bureau of Land Management. 2015b. Rawlins Field Office. Lost Creek Uranium In Situ Recovery Project. Accessed online: http://www.blm.gov/wy/st/en/info/NEPA/documents/rfo/lostcreek.html.

Bureau of Land Management. 2016a. BLM Wyoming Sensitive Species List. Wyoming State Office, Cheyenne, Wyoming. Accessed online: http://www.blm.gov/wy/st/en/programs/Wildlife.html. February.

Bureau of Land Management. 2016b. Environmental Impact Statement, Continental Divide-Creston Natural Gas Development Project, Air Quality Technical Support Document, U.S. Department of Interior, Bureau of Land Management Wyoming High Desert District - Rawlins Field Office, Wyoming, April 2016.

Bureau of Land Management. 2016c. Final Environmental Impact Statement, Continental Divide-Creston Natural Gas Development Project, U.S. Department of the Interior, Bureau of Land Management High Desert District - Rawlins Field Office, Wyoming, April 2016.

Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Geological Survey, and Bureau of Indian Affairs. 1998. Guidelines for Interpretation of the Biological Effect of Selected Constituents in Biota, Water, and Sediment: Selenium. USDI National Irrigation Water Quality Program Information Report No. 3.

Burns, K., J. Blodgett, M. Jackson, B. Howell, W. Jacobi, A. Schoettle, A.M. Casper, and J. Klutsch. 2011. Monitoring Limber Pine Health in the Rocky Mountains and North Dakota. Pages 47 to 50 in RE Keane, D.F. Tomback, M.P. Murray, and C.M Smith (editors). The Future of High-Elevation, Five-Needle White Pines in Western North America: Proceedings of the High Five Symposium. USDA Forest Service RMRS-P-63.

Campbell, E.M., R.E. Keane, E.R. Larson, M.P. Murray, A.W. Schoettle, and C.Wong. 2010. Disturbance Ecology of High-Elevation Five-Needle Pine Ecosystems in Western North America. Pages 154 to 163 in R.E. Keane, D.F Tomack, M.P. Murray, and C.M. Smith (editors). The future of high-elevation, five-needle white pines in Western North America: Proceedings of the High Five Symposium. USDA-Forest Service Proceedings RMRS-P-63, Fort Collins, CO. Accessed online: www.fs.fed.us/rm/pubs/rmrs_p063.html.

Campbell, L. 2012. Fremont County Deputy Assessor. E-mail Correspondence with Edge Environmental, Inc. January 4.

Carvalho, R., D. Chambers, S. Fesenko, W.S. Moore, D. Porcelli, H. Vanderhove, and T. Yankovich. 2014. Environmental Pathways and Corresponding Models. Pages 106 to 172, in The Environmental Behavior of Radium: Revised Edition. Technical Reports Series No. 476. International Atomic Energy Agency, Vienna.

Case, J.C. 1997. Earthquakes and active faults in Wyoming. Wyoming State Geological Survey Preliminary Hazards Report 97 2.

Casper Star Tribune. 2014. “Carbon County school officials vote to close Bairoil Elementary.” March 2.

Census Bureau. 2001. Census 2000. Release Date: May 15 – June 7, 2001. Accessed online: www.census.gov.

Census Bureau. 2011. Census 2010. Release Date: February 3 – March 24, 2011. Accessed online: www.census.gov.

Census Bureau. 2013a. 2008 – 2012 American Community Survey 5-Year Estimates. Release Date: December 17, 2013. Accessed online: www.census.gov.

Census Bureau, 2013b. 2012 Small Area Income and Poverty Estimates. Release Date: December 2013. Accessed online: www.census.gov/did/www/saipe/index.html.

Chalfoun, A. D., F. R. Thompson, III, and M. J. Ratnaswamy. 2002. Nest Predators and Fragmentation: a Review and Meta-analysis. Conservation Biology 16:306–318.

Christiansen, T. 2009. Fence Marking to Reduce Greater Sage-grouse (*Centrocercus urophasianuse*) Collisions and Mortality near Farson, Wyoming. Interim Report, Wyoming Game and Fish Department, Accessed online: www.wgfd.wyo.gov/web2011/wildlife-1000817.aspx.

Church, M.M. 2009. Vegetation Management in a Greasewood-Dominated Floodplain of the Green River, Colorado. M.S. Thesis, University of Wyoming, Laramie, Wyoming.

Church, M. 2013. Fremont County Weed and Pest, Lander, Wyoming. Personal Communication with Edge Environmental, Inc., Laramie, Wyoming. October 24, 2013.

Clark, D.R. and R.L. Hothem. 1991. Mammal Mortality at Arizona, California, and Nevada Gold Mines Using Cyanide Extraction. California Fish and Game 77:61-69.

Clark, L., J. Hall, R. McLean, M. Dunbar, K. Klenk, R. Bowen, and C.A. Smeraski. 2006. Susceptibility of Greater Sage-grouse to Experimental Infection with West Nile Virus. Journal of Wildlife Diseases 42(1):14-22.

Cohen, P. 2015. Assistant Supervisor, Fremont County Weed and Pest. Personal Communication with Edge Environmental, Inc. November 20.

Collentine, M., R. Libra, K. Feathers, and L. Hamden. 1981. Volume VI-A Occurrence and Characteristics of Ground Water in the Great Divide and Washakie Basins, Wyoming; Water Resources Research Institute, University of Wyoming, Laramie, Wyoming, August 1981.

Comer, R.D. 1982. Understanding Secondary Effects of Development on Wildlife Resources in Mitigation Planning. Pages 16-31 in Issues and Technology in the Management of Impacted Western Wildlife. Thorne Ecological Institute Technical Publication No. 14. Boulder, Colorado.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation Assessment of Greater Sage-grouse and Sagebrush Habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming.

Connely, M.V. 2011. Paleontological Field Survey, Sheep Mountain Mine. Stratigraphic rex, LLC. BLM Permit #PA02-WY-090. Casper, Wyoming.

Council of Environmental Quality (CEQ). 1997. Environmental Justice – Guidance Under the National Environmental Policy Act. December 10.

Council on Environmental Quality. 2014. Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews. 40 CFR Parts 1500, 1501, 1502, 1505, 1506, 1507, and 1508. January 2014.

County10, 2013. News report. Accessed online: www.county10.com/2013/07/25/jeffrey-city-gets-ambulance-for-the-first-time-in-decades.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service. December.

Creel, S., J.E. Fox, A. Hardy. J. Sands, B. Garrott, and R.O. Peterson. 2002. Snowmobile Activity and Glucocorticoid Stress Responses in Wolves and Elk. Conservation Biology 16:809-814.

Darnell, J.D. 2012. Lieutenant, Jeffrey City Volunteer Fire Department. Personal Communication with Edge Environmental, Inc. January 13.

Denson, N.M., H.D. Zeller, and J.G. Stephens. 1955. “Water sampling as a guide in the search for uranium deposits and its use in evaluating widespread volcanic units as potential source beds for uranium" in Contributions to the Geology of Uranium and Thorium by the United States Geological Survey and Atomic Energy Commission for the United States International Conference on Peaceful Uses of Atomic Energy, Geneva, Switzerland. USGS Professional Paper 300.

Dinkins, J.B., M.R. Conover, C.P Kirol, and J.L. Beck. 2012. Greater Sage-grouse (*Centrocercus urophasianus*) Select Nest Sites and Brood Sites away from Avian Predators. The Auk 129(4):600-610.

Dooling, R.J. and S.H. Hulse. 1989. The Comparative Psychology of Audition: Perceiving Complex Sounds. Lawrence Erlbaum Associates, Hillsdale, New Jersey.

Driscoll, F.G. 1986. Groundwater and Wells. Johnson Division. St. Paul Minnesota.

Driver, C.J. 1994. Ecotoxicity Literature Review of selected Hanford Site Contaminants: U.S. Department of Energy, Pacific Northwest Laboratory, PNL-9394, Richland, Washington.

Eckles, D. and T. K. Larson. 2011. Results of a Class III Cultural Resource Inventory for Titan Uranium USA, Inc.: The Sheep Mountain Uranium Project, Expanded Disturbance Areas. LTA, Inc., Laramie, Wyoming.

Energy Fuels Resources (USA) Inc. 2013. 2013 Annual Report for Permit 381C, Sheep Mountain Mines, Fremont County, Wyoming. Energy Fuels Resources (USA) Inc. Lakewood, Colorado.

Energy Fuels Resources (USA) Inc. 2014. Personal Communication with Edge Environmental, Inc. Response to February 10, 2014 Data Request.

Energy Fuels Resources (USA) Inc. 2015a. Plan of Operations. Sheep Mountain Project. Fremont County, Wyoming. October.

Energy Fuels Resources (USA) Inc. 2015b. Wyoming Pollutant Discharge Elimination System permit application to Wyoming Department of Environmental Quality-Water Quality Division. July.

Engineering Analytics, Inc. 2013. Sheep Mountain Project Seismic Hazard Analysis; Project No. 110095b, Energy Fuels.

ENVIRON. 2010. “User’s Guide Comprehensive Air Quality Model with Extensions (CAMx) Version 4.50.” ENVIRON International Corporation, Novato, California. (www.camx.com). September.

ENVIRON. 2013. The Mesoscale Model Interface Program (MMIF) Version 3.0, Draft User’s Manual. Prepared for Environmental Protection Agency Office of Air Quality Planning and Standards, Air Quality Assessment Division, Air Quality Modeling Group, Research Triangle Park, North Carolina. September 30, 2013.

ENVIRON, Alpine Geophysics, and University of North Carolina. 2012. Western Regional Air Partnership (WRAP) West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) WRF Application/Evaluation. Prepared for Tom Moore WRAP. January 20, 2012.

Environmental Protection Agency (EPA). 1988. Federal Guidance Report No. 11. Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion. EPA 520/1-88-020. September.

Environmental Protection Agency. 1989. Risk Assessments, Environmental Impact Statement, NESHAPs for Radionuclides, Background Information Document, Volume 2, EPA/520/1-89-006-1, Office of Radiation Programs. Washington, D.C. September.

Environmental Protection Agency. 1998. Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Analysis. April. Accessed online: www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_epa0498.pdf.

Environmental Protection Agency. 2005. "Assessment of Variations in Radiation Exposure in the United States (Revision 1)." Contract Number EP-D-05-02. Washington, D.C. July 15, 2005.

Environmental Protection Agency. 2008. Inorganic Chlorates Facts. EPA 738-F-08-001. Accessed online: www.epa.gov/oppsrrd1/REDs/factsheets/inorganicchlorates-fs.pdf.

Environmental Protection Agency. 2011a. Accessed online: www.water.epa.gov/scitech/drinkingwater/dws/ccl/sodium.cfm. October 19.

Environmental Protection Agency. 2011b. PSD and Title V Permitting Guidance for Greenhouse Gases. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards Air Quality Policy Division. Research Triangle Park, NC. EPA-457/B-11-001. March 2011.

Environmental Protection Agency. 2012. Radon Zone Map. Accessed online: www.epa.gov/radon/zonemap.html. November 2013.

Environmental Protection Agency. 2013a. Clean Air Status and Trends Network (CASTNET). Accessed online: http://java.epa.gov/castnet/viewsiteinfo.do. October 2011.

Environmental Protection Agency. 2013b. Basic Information about Pathogens and Indicators in Drinking Water: Treatment Techniques and MCLs Pertaining to Indicators. Accessed online: http://water.epa.gov/drink/contaminants/basicinformation/pathogens.cfm. July.

Environmental Protection Agency. 2013c. Citizen's Guide to Radon. Accessed online: http://www.epa.gov/radon/pubs/citguide.html. April 2014.

Environmental Protection Agency. 2014a. EPA FLIGHT (Facility Level Information on Greenhouse Gases Tool). 2012 Greenhouse Gas Emissions from Large Facilities. U.S. Environmental Protection Agency, Washington D.C. Accessed online: http://ghgdata.epa.gov/ghgp/main.do. July 26, 2014.

Environmental Protection Agency. 2014b. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012. U.S. Environmental Protection Agency, Washington D.C. EPA 430-R-14-003. April 15, 2014.

Environmental Protection Agency. 2015. 40 CFR Parts 50, 51, 52, 53, and 58, National Ambient Air Quality Standards for Ozone, Environmental Protection Agency Final Rule. Federal Register Volume 80, No. 206, 10/26/2015. Accessed online: http://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf.

Farmer, A.M. 1993. The Effects of Dust on Vegetation – A Review. Environmental Pollution 79:63-75.

Faulkner, D.W. 2010. Birds of Wyoming. Roberts and Company, Greenwood Village, Colorado.

Federal Highway Administration (FHWA). 1995. Highway Traffic Noise Analysis and Abatement Policy and Guidance. U.S. Department of Transportation, Federal Highway Administration. Washington, D.C.

Federal Highway Administration. 2011. Highway Traffic Noise – Construction Noise Handbook. U.S. Department of Transportation, Federal Highway Administration. Accessed online: http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook00.cfm.

Federal Land Managers' Air Quality Related Values Workgroup (FLAG). 2010. Federal Land Managers' Air Quality Related Values Workgroup Phase I Report – Revised (2010). U.S. Forest Service-Air Quality Program, National Park Service-Air Resources Division, U.S. Fish and Wildlife Service-Air Quality Branch. October 2010.

Fedy, B.C., C.L. Aldridge, K.E. Doherty, M. O'Donnell, J.L Beck, B. Bedrosian, M.J. Holloran, G.D. Johnson, N.W. Kaczor, C.P. Kirol, C.A. Mandich, D. Marshall, G. McKee, C. Olson, C.C. Swanson, and B.L. Walker. 2012. Interseasonal Movements of Greater Sage-grouse, Migratory Behavior, and Assessment of the Core Regions Concept in Wyoming. Journal of Wildlife Management 76(5):1062-1071.

Fenneman, N.M. 1928. Physiographic Divisions of the United States; Annals of the Association of American Geographers Volume 18, No. 4, December 1928.

Fertig, W., R. Black, and P. Wolken. 2005. Rangewide Status Review of Ute Ladies'-Tresses (*Spiranthes diluvialis*). U.S. Fish and Wildlife Service and Central Utah Water Conservancy District.

Fesenko, S., F. Carvalho, P. Martin, W.S. Moore, and T. Yankovich. 2014. Radium in the Environment. Pages 33 to 105 in The Environmental Behavior of Radium: Revised Edition. Technical Reports Series No. 476. International Atomic Energy Agency, Vienna.

Fluer, S. 2013. Wild Horse Specialist, Bureau of Land Management Lander Field Office. E-Mail Communication with Edge Environmental, Inc. January 13.

Forman, R.T. and L.E. Alexander. 1998. Roads and their Major Ecological Effects. Annual Review of Ecology and Systematics. 29:207-231.

Fox, D., A.M. Bartuska, J G. Byrne, E. Cowling, R. Fisher, G.E. Likens, S.E. Lindberg, R.A. Linthurst, J. Messer, and D.S. Nichols. 1989. A Screening Procedure to Evaluate Air Pollution Effects on Class I Wilderness Areas. General Technical Report RM-168. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado. 36 pp.

Fremont County. 2004a. Natural Resources Planning Committee. Fremont County Land Use Plan. September.

Fremont County. 2004b. Weed and Pest Control District (WPCD). ESRI Shapefile of Noxious Weeds in Fremont County, Wyoming.

Fremont County. 2007-2013. Fremont County Treasurer's Office. Audited Financial Reports for Fiscal Years 2006 through 2012. Accessed online: http://fremontcountywy.org/treasurer/county-finances/.

Fremont County. 2011. Weed and Pest Control District. Accessed online: http://fcwp.org/.

Fremont County. 2013. Valuation Reports: Assessed Value Summary and State Assessed Valuations for 2012. Accessed online: fremontcountywyorg/county-assessor/resources-forms-publications/.

Gardner. K.E. 1999. The Importance of Surface Water/Groundwater Interactions Issue Paper. Environmental Protection Agency. 1998 EPA Intern Program Project. Office of Water/Water Quality Unit. EPA 910-R-99-013.

Gateway West. 2014. Gateway West Transmission Line Project. Accessed online: www.gatewaywestproject.com/default.aspx. May.

Gilbert, M. and A.D. Chalfoun. 2011. Energy Development Affects Populations of Sagebrush Songbirds in Wyoming. Journal of Wildlife Management 75:816-824.

Glisson, B. 2004*. Physaria saximontana Rollins var. saximontana* (Fremont County twinpod): A Technical Conservation Assessment. USDA Forest Service, Rocky Mountain Region, Accessed online: http://www.fs.fed.us/r2/projects/scp/assessments/physariasaximontanavarsaximontana.pdf.

Goodrich, B.A., R.D. Koski, and W.R. Jacobi. 2008. Roadside Vegetation Health Condition and Magnesium Chloride ($MgCl_2$) Dust Suppressant Use in Two Colorado U.S. Counties. Arboriculture and Urban Forestry 34(4):252-259.

Hagen, C.A. 2009. Predation on Greater Sage-grouse: Facts, Process, and Effects. Chapter 8 *in* S.T. Knick and J.W. Connelly (Associate Editors), C.E. Braun (Technical Editor). Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and its Habitats. Studies in Avian Biology, No. 38.

Hallberg, L.L. and J.C. Case. 2011. Bairoil 1:100,000-scale Surficial Geologic Map: Carbon, Sweetwater, Fremont, and Natrona Counties, Wyoming; Wyoming State Geological Survey, Open File Report 11-4.

Hannum, S. 2012. Fire Chief. Rawlins Fire Department. Personal Communication with Edge Environmental, Inc. January 12.

Harris, R.E. and R.A. Davis. 1998. Evaluation of the Efficacy of Products and Techniques for Airport Bird Control. Aerodrom Safety Branch, Transport Canada, Ottawa, Ontario.

Harter, S. 2013a. 2012 Job Completion Report, Mule Deer Sweetwater Herd Unit MD646. Wyoming Game & Fish Department, Cheyenne, Wyoming.

Harter, S. 2013b. 2012 Job Completion Report, Moose Lander Herd Unit MO620. Wyoming Game & Fish Department, Cheyenne, Wyoming.

Hausel, W.D., G. B.Glass, D.R. Lageson, A. Ver Ploeg, and R.H. Debruin. 1979. Wyoming Mines and Minerals Map.

Hersloff, J., J.A. Johnson, and S. Ibrahim. 1988. Radiological Risk Assessment for Abandoned Mine Lands, Radium Land Clean-Up Standard. Report prepared for the Wyoming Department of Environmental Quality.

Hester, S.G. and M.B. Grenier. 2005. A Conservation Plan for Bats in Wyoming. Wyoming Game & Fish Department, Nongame Program, Lander, Wyoming.

Hinck, J.E., G. Linder, S. Finger, E. Little, D. Tillit, and W. Kuhne. 2010. Biological Pathways of Exposure and Ecotoxicity Values for Uranium and Associated Radionuclides. Pages 287 to 351 in A.E. Alpine (editor). Hydrological, Geological, and Biological Site Characterization of Breccia Pipe Uranium Deposits in Northern Arizona. Scientific Investigations Report 2010-5025. USDI-U.S. Geological Survey.

Hobbs, N.T. 1989. Linking Energy Balance to Survival in Mule Deer: Development and Test of a Simulation Model. Wildlife Monographs 101:1-39.

Holloran. M.J. 2005. Greater Sage-Grouse (*Centrocercus urophasiamus*) Population Response to Natural Gas Field Development in Western Wyoming. December.

Holloran, M.J. and S.H. Anderson. 2005. Spatial distribution of greater sage-grouse nests in relatively contiguous sagebrush habitats. The Condor. 107:742-752.

Hooper, M., J. Isanhart, and S. Cox. 2007. Avian Consumption and Use of Contaminated Water Sources: Toxicological Assessments of Exposure, Effects and Susceptibility. Report Number RW055-T04-47-A. Institute of Environment and Human Health, Texas Tech University, Lubbock, Texas.

Hudson, N. 2012. Administrator, Lander Volunteer Fire Department. Personal Communication with Edge Environmental, Inc. January 13.

Hunter, C.L., F.J. Trelese, and J.A. Bilyou. 1971. Wyoming Water Planning Program. Report No. 7 – Irrigated Lands Inventory for Wyoming.

Hyatt, K. 2014. Wyoming Department of Environmental Quality, TMDL Program - Water Quality Division. Email Communication with K. Morrison, Energy Fuels. November 10, 2014.

Ingelfinger, F. and S. Anderson. 2004. Passerine Response to Roads Associated with Natural Gas Extraction in a Sagebrush Steppe Habitat. Western North American Naturalist 64:385-395.

Intergovernmental Panel on Climate Change. (IPCC). 2013. Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. [Stocker, T. F., D. Qin, G. K. Plattner, M. Tignor, S. K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex, and P. M. Midgley (eds.)] Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 1,535 pp.

Jones, G. 2008. Sensory Ecology: Noise Annoys Foraging Bats. Current Biology 18(23):R1098-R1100.

Jones, N.R., R.W. Gregory, and J.F. McLaughlin. 2011. Geologic Map of the Bairoil 30' x 60' Quadrangle, Carbon, Sweetwater, Fremont, and Natrona Counties, Wyoming; Wyoming State Geological Survey, Map Series 86.

Keefer, W.R. 1965. Stratigraphy and Geologic History of the Uppermost Cretaceous, Paleocene, and Lower Eocene Rocks in the Wind River Basin, Wyoming; Geological Survey Professional Paper 495-A.

Knechtel, M.M. and S.H. Patterson. 1956. Bentonite Deposits in Marine Cretaceous Formations, Hardin District, Montana and Wyoming: U.S. Geological Survey Bulletin 1023.

Knick, S.T. and J.T. Rotenberry. 1997. Landscape characteristics of disturbed shrubsteppe habitats in southwestern Idaho (USA). Landscape Ecology 12:287–297.

Knick, S.T. and J.T. Rotenberry. 2002. Effects of Habitat Fragmentation on Passerine Birds in Intermountain Shrubsteppe. Studies in Avian Biology No. 25:130-140.

Kuijper, D.P.J., J. Schut1, D. van Dullemen, H. Toorman, N. Goossens, J. Ouwehand, and H.J.G.A. Limpens. 2008. *Experimental Evidence of Light Disturbance along the Commuting Routes of Pond Bats (Myotis dasycneme)*. Lutra 51:37-49.

Larson, T. 2010. Cultural Resource Investigations of Federal Surface within the Titan Uranium USA, Inc. Sheep Mountain Uranium Project: The Congo Pit and Sheep Underground Mines. Shay Davis and Charity Taylor. LTA, Inc. Laramie, Wyoming.

Larson, T. K. 2014. Results of the 2014 Class III Cultural Resource Inventory for Additional Disturbance Areas at the Energy Fuels Sheep Mountain Mine. LTA, Inc. Laramie, Wyoming.

Larson, T and M. Hooten. 2013. Results of a Class III Cultural Resource Inventory of Proposed Disturbance Areas at the Energy Fuels Sheep Mountain Mine. LTA, Inc. Laramie, Wyoming.

Leedy, D.L. 1975. Highway-Wildlife Relationships. Volume 1; A State-of-the-Art Report. Federal Highway Administration Report Number FHWA-RD-76-4. Washington, D.C.

Lemly, A.D. 1996. Selenium in Aquatic Organisms. Pages 427-445 in W.N. Beyer, G.H. Heinz, A.W. Redmond-Norwood (editors). Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations. Lewis Publishers, Boca Raton, Florida.

Lewis, M.B. 2013. Roads and the Reproductive Ecology of *Hesperidanthus suffrutescens*, an Endangered Shrub. M.S. Thesis, Utah State University, Logan, Utah.

Lidstone and Associates, Inc. (Lidstone). 2013. Baseline Surface Water Hydrology Report Sheep Mountain Project. Prepared for Energy Fuels Resources (USA) Inc. October 2013.

Lidstone and Wright Environmental Services (Lidstone and Wright). 2013. Baseline Groundwater Hydrogeology Report Sheep Mountain Project. November.

Likins, J. 2012. Bureau of Land Management – Lander Field Office, Range Management Specialist (Retired). Personal Communication with K. Yannone, Bureau of Land Management, Lander Field Office.

Little, C. 2014. Two Lines, Inc. Radiation Risk Consultants. Personal Communication with Edge Environmental, Inc. July.

Little, C. 2015. Two Lines, Inc. Radiation Risk Consultants. Response to Public Comments on DEIS. September.

Lopez, M. 2012. Small Wastewater Specialist. Fremont County Planning Department. Personal Communication with Edge Environmental, Inc. March 13.

Love, J.D. 1961. Split Rock Formation (Miocene) and Moonstone Formation (Pliocene) in Central Wyoming, USGS Bulletin 1121-I. Accessed online: http://pubs.usgs.gov/bul/1121i/report.pdf. June 2015.

Love, J.D. 1970. Cenozoic Geology of the Granite Mountains Area, Central Wyoming. USGS Professional Paper 495-C, 154 p.

Love, J.D. and A.C. Christensen. 1985. Geologic Map of Wyoming; U.S. Geological Survey.

Lyon, A.G. and S.H. Anderson. 2003. Potential gas development impacts on sage-grouse nest initiation and movement. Wildlife Society Bulletin 31: 486-491.

Marten, T.E. and G.R. Geupel. 1993. Nest-monitoring Plots: Methods for Locating Nest and Monitoring Success. Journal of Field Ornithology 64(4):507-519.

Marzluff, J.M. and E. Neatherlin. 2006. Corvid Response to Human Settlements and Campgrounds: Causes, Consequences, and Challenges for Conservation. Biological Conservation 130: 301-314.

Mason, J.P. and K.A. Miller. 2005. Water Resources of Sweetwater County, Wyoming: U.S. Department of the Interior, U.S. Geological Survey: Scientific Investigations Report 2004-5214.

Miller, R.F., R.J. Tausch, E.D. McArthur, D.D. Johnson, and S.C. Sanderson. 2008. Age Structure and Expansion of Piñon-Juniper Woodlands: A Regional Perspective in the Intermountain West. USDA-Forest Service Research Paper Report RMRS-RP-69.

Morrison, K. 2014. Environmental Manager, Energy Fuels. E-mail Communication with Edge Environmental, Inc., June 9.

National Aeronautics and Space Administration (NASA) Goddard Institute for Space Studies. 2013. NASA Finds 2012 Sustained Long-Term Climate Warming Trend. Accessed online: http://www.nasa.gov/topics/earth/features/2012-temps.html. January 15.

National Highway Traffic Safety Administration (NHTSA). 2013. Fatality Analysis Reporting System. Traffic Safety Performance (Core Outcome) Measures for Wyoming. Accessed online: www.nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/STSI/56_WY/2012/56_WY_2012.htm.

National Highway Traffic Safety Administration. 2014. Traffic Safety Performance Measures for Wyoming. Accessed online: www.nrd.nhtsa.dot.gov/departments/nrd-30/ncsa/STSI/56_WY/2012/56_WY_2012.htm. Accessed April 11.

National Oceanic and Atmospheric Administration (NOAA) National Climate Data Center. 2013. State of the Climate: Global Analysis for Annual 2013. National Climate Data Center. Accessed online: http://www.ncdc.noaa.gov/sotc/global/2013/13.

National Park Service (NPS). 2014. National Park Service Air Resources Division, Email from Andrea Stacy NPS to Charis Tuers BLM Wyoming State Office regarding applicable critical load values for Wyoming and Colorado. August 15.

Natural Resources Conservation Service (NRCS). 2014. Soil Survey of Fremont County, Lander Area. Accessed online: http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.

Nicholoff, S.H., compiler. 2003. Wyoming Bird Conservation Plan, Version 2.0. Wyoming Partners In Flight. Wyoming Game & Fish Department, Lander, Wyoming.

Nuclear Regulatory Commission (NRC). 1980. Regulatory Guide 4.14. *Radiological Effluent and Environmental Monitoring at Uranium Mills*. Revision 1. Nuclear Regulatory Commission Office of Standards Development. Washington, D.C.

Nuclear Regulatory Commission. 2002. Design of Erosion Protection for Long-Term Stabilization (NUREG-1623, Final Report). Accessed online: http://www.nrc/gov/reading-rm/doc-collections/nuregs/staff/sr1623/.

Nuclear Regulatory Commission. 2013. Doses in Our Daily Lives. Accessed online: http://www.nrc.gov/about-nrc/radiation/around-us/doses-daily-lives.html. November 2013.

Nuclear Regulatory Commission. 2014. Standard Review Plan for Conventional Uranium Mill and Heap Leach Facilities (NUREG 2126 - Draft Report for Comment). Accessed online: http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr2126/.

Occupational Safety and Health Administration (OSHA). 1988. Memorandum of Understanding Between the U.S. Nuclear Regulatory Commission and the Occupational Safety and Health Administration. November 16, 1988. Accessed online: http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=MOU&p_id=233. November 2013.

Occupational Safety and Health Administration. 2016. Online OSHA Training. Accessed online: https://www.osha.gov/dsg/hazcom/global.html. February.

Parker, K.L., C.T. Robbins, and T.A. Hanley. 1984. Energy Expenditures for Locomotion by Mule Deer and Elk. Journal of Wildlife Management 48:474-488.

Patricelli, G.L, J.L. Blickley, and S.L. Hooper. 2012. The Impacts of Noise on Greater Sage-Grouse: A Discussion of Current Management Strategies in Wyoming with Recommendations for Further Research and Interim Protections. Unpublished report for USDI-Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming.

Peter G. Peterson Foundation. 2014. “How Much Do Americans Pay in Federal Taxes.” Accessed online: http://pgpf.org/budget-explainer/taxes. April 15.

Peterson, J.A. and A.V. Nebeker. 1992. Estimation of Waterborne Selenium Concentrations That Are Toxicity Thresholds for Wildlife. Archives of Environmental Contamination and Toxicology 23:154-162.

Pipiringos, G.N. 1955. Tertiary Rocks in the Central Part of the Great Divide Basin, Sweetwater County, Wyoming; WGA, 2005, Green River Basin; 10th Annual Field Conference Guidebook pgs. 100-104.

Rai, A., K. Kulshreshtha, P.K. Srivastiva, and C.S. Mohanty. 2009. Leaf Surface Structure due to Particulate Pollution in Some Common Plants. Environmentalist (published online June 3, 2009).

Ramirez, P. 2010. Bird Mortality in Oil Field Wastewater Disposal Facilities. Environmental Management 46:820-826.

Real West Natural Resource Consulting. (Real West). 2011. Appendix D9 – Wildlife 2011 Addendum. Sheep Mountain Project, Mine Permit 381C. Titan Uranium USA, Inc., Casper, Wyoming.

Real West Natural Resource Consulting. 2013. Wildlife Ecology Report, Sheep Mountain Project. Prepared for Energy Fuels Resources (USA) Inc. September.

Real West Natural Resource Consulting. 2014. Appendix C, 2014 Raptor Surveys for Sheep Mountain Permit Area. Submitted to Energy Fuels Resources, Inc. Real West Natural Resource Consulting, Laramie, Wyoming.

Reisen, W.K., C.M. Barker, R. Carney, H.D. Lothrop, S.S. Wheeler, J.L. Wilson, M.B. Madon, R. Takahashi, B. Carroll, S. Garcia, Y. Fang, M. Shafii, N. Kahl, S. Ashtari, V. Kramer, C. Glaser, and C. Jean. 2006. Role of Corvids in Epidemiology of West Nile Virus in Southern California. Journal of Medical Entomology 43(2):356-367.

Robertson, D.E., D.A. Cataldo, B.A. Napier, K.M. Krupka, and L.B. Sasser. 2003. Literature Review and Assessment of Plant and Animal Transfer Factors used in Performance Assessment Modeling. NUREG/CR-6825, PNNL-14321, US Nuclear Regulatory Commission, Pacific Northwest National Laboratory, Richland, Washington.

Romin, L.A. and J.A. Muck. 2002. Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances. U.S. Fish and Wildlife Service, Utah Field Office, Salt Lake City, Utah.

Roscoe Postle Associates Inc. (RPA). 2006. Technical Report on the Sheep Mountain Uranium Project, Wyoming; Prepared for Uranium Power Corporation. October 10.

Rumble, M.A. and A.J. Bjugstad. 1986. Uranium and Radium Concentrations in Plants Growing on Uranium Mill Tailings in South Dakota. Reclamation and Revegetation Research 4:271-277.

Rydell, J. and P.A. Racey. 1993. *Street Lamps and the Feeding Ecology of Insectivorous Bats*. (Abstract) Symposium on Recent Advances in Bat Biology, Zoological Society of London.

Sage-Grouse National Technical Team. 2011. A Report on National Greater Sage-Grouse Conservation Measures. December.

Samuel, W.M., M.S. Mooring, and I.O. Aalangdong. 2000. Adaptations of winter ticks (*Dermacentor albipictus*) to invade moose and moose to evade ticks. Alces 36:183-195.

Saros, J.E., D.W. Clow, T. Blett, and A.P. Wolfe. 2010. “Critical nitrogen deposition loads in high-elevation lakes of the western U.S. inferred from paleolimnological records”. Water, Air & Soil Pollution, DOI 10.1007/s11270-010-0526-6.

Sauer, J.R., J.E. Hines, J.E. Fallon, K.L. Pardieck, D.J. Ziolkowski, and W.A. Link. 2014. The North American Breeding Bird Survey, Results and Analysis 1966 - 2011. Version 07.03.2013. USGS Patuxent Wildlife Research Center, Laurel, Maryland.

Schmidt, C.A. 2014. Bat Habitat and Radon Concentrations at Roosts in Abandoned Uranium Mines. M.S. Thesis, Northern Arizona University, Flagstaff, Arizona (abstract only).

Schroeder, M.A., J.R. Young, and C.E. Braun. 1999. Sage grouse (*Centrocercus urophasianus*). Pages 1-28 in A. Poole and F. Gill, editors. The Birds of North America, No. 425. The Birds of North America, Philadelphia, Pennsylvania, USA.

Sharifi, M.R., A.C. Gibson, and P.W. Rundel. 1997. Surface Dust Impacts on Gas Exchange in Mojave Desert Shrubs. Journal of Applied Ecology 34:837-846.

Sheriff, M.J., B. Dantzer, B. Delehanty, R. Palme, and R. Boonstra. 2011. Measuring Stress in Wildlife: Techniques for Quantifying Glucocorticoids. Oecologia 166:869-887.

Soister, P.E. 1968. Stratigraphy of the Wind River Formation in South-Central Wind River Basin, Wyoming; U.S. Geological Survey Professional Paper 594-A.

Stanford, C. 2014. Uniform Crime Reports (UCR) Program Manager, Division of Criminal Investigation, Wyoming State Attorney General’s Office. 2012 Arrest Statistics. E-mail correspondence with J. Montag, BLM Wyoming State Office. April 25.

State of Wyoming. 2015. Office of the Governor, Executive Order 2015-4. Greater Sage-Grouse Core Area Protection. July.

Stephens, J.G. 1964. Geology and Uranium Deposits at Crooks Gap, Fremont County, Wyoming; U.S. Geological Survey Bulletin 1147-F.

Stone, E.L., G. Jones, and S. Harris. 2009. *Street Lighting Disturbs Commuting Bats*. Current Biology 19(13):1123-1127.

Stratus Consulting, Inc. 2003. Preassessment Screen for the Chino, Tyrone, and Morenci Mine Sites, Grant County, New Mexico and Morenci Arizona. Report submitted to U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Strohmayer, P. 1999. Soil Stockpiling for Reclamation and Restoration Activities after Mining and Construction. Restoration and Reclamation Review. University of Minnesota. Vol. 4, No. 7. Spring.

Sullivan, J. 1996. *Taxidea taxus*. In: Fire Effects Information System, USDA-Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory. Accessed online: http://www.fs.fed.us/database/feis/animals/mammal/tata/all.html.

Sullivan, R. 1980. The Stratigraphic Evaluation of the Eocene Rocks of Southwestern Wyoming; Geological Survey of Wyoming Report of Investigations No. 20, pgs. 4-15.

Summers, D.D. 2005. Vegetation Response of a Wyoming Big Sagebrush (*Artemisia tridentate ssp. wyomingensis*) Community to Six Mechanical Treatments in Rich County, Utah. M.S. Thesis, Brigham Young University, Provo, Utah.

Svensson, A.M. and J. Rydell. 1998. *Mercury Vapour Lamps Interfere with the Bat Devence of Typanate Moths (Operophtera spp.; Geometridae)*. Animal Behavior 55:223-226.

Sweetwater County. 2014. Assessor's Office. County Valuation Charts accessed online: www.sweet.wy.us/index/aspx?NID=86.

Taylor, K., T. Brummer, M.L. Taper, A. Wing, and L.J. Rew. 2012. Human-mediated Long-distance Dispersal: An Empirical Evaluation of Seed Dispersal by Vehicles. Diversity and Distributions 2012: 1-10.

Temte, D. 2010. Senior Legislative Analyst, Wyoming Legislative Service Office. Wyoming Severance Taxes and Federal Mineral Royalties. July.

Titan Uranium. 2011. Sheep Mountain Project USNRC License Application Environmental Report - Draft. Prepared for Titan Uranium USA by Wright Environmental Services Inc. and BRS Engineering. Volumes 1 and 2, October.

Transport Canada. 2010. Exclusion Methods. Air Transportation, Transport Canada. Accessed online: https://www.tc.gc.ca/eng/civilaviation/publications/tp13029-exclusion-menu-1517.htm.

TripAdvisor. 2014. Accessed online: www.rvparkreveiws.com.

Uniform Building Code (UBC). 1997. Uniform Building Code, Volume 3: Material, Testing, and Installation Standards; International Conference of Building Officials, Whittier, California.

United Nations Committee on the Effects of Atomic Radiation (UNSCEAR). 2000. Sources and Effects of Ionizing Radiation, UNSCEAR 2000 Report to the General Assembly, with Scientific Annexes, Volume I: Sources. United Nations: New York.

Urbatsch, T. 2014. Sweetwater County Dispatch and Emergency Services. Shift Supervisor and Communications Coordinator. Personal Communication with Edge Environmental, Inc. April 28.

U.S. Army Corps of Engineers (USACE). 2014. Letter from Thomas B. Johnson to Kimberly Morrison, Energy Fuels, dated November 26, 2014.

U.S. Department of Agriculture. 2002. 2002 Census of Agriculture. Accessed online: www.agcensus.usda.gov/Publications/2002/.

U.S. Department of Agriculture. 2003. National Range and Pasture Handbook. Revision 1. Natural Resources Conservation Service, Grazing Lands Technology Institute. Accessed online: http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17734.wba.

U.S. Department of Agriculture. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. Accessed online: http://soils.usda.gov/survey/geography/mlra/.

U.S. Department of Agriculture. 2014a. National Agricultural Statistics Service – Wyoming Field Office. Wyoming Agricultural Statistics 2013. Accessed online: www.nass.usda.gov/Statistics_by_State/Wyoming/Publications/Annual_Statistical_Bulletin/.

U.S. Department of Agriculture. 2014b. 2012 Census of Agriculture. Released May 2. Accessed online: www.agcensus.usda.gov/Publications/2012/.

U.S. Department of Energy. 2007. Uranium Leasing Program Final Programmatic Environment Assessment. Office of Legacy Management. DOE/EA-1535. Doc. No. Y0011700.

U.S. Department of Energy. 2012. Office of Legacy Management. Process for Transition of Uranium Mill Tailings Radiation Control Act Title II Disposal Sites to the U.S. Department of Energy Office of Legacy Management for Long-Term Surveillance and Maintenance - LMS/S05096. Accessed online: http://www.lm.doe.gov/linkfiles/Title_II_Transition_Process.aspx. May 4, 2015.

U.S. Department of Housing and Urban Development (HUD). 2006. Office of Policy Development and Research. Housing Impact Analysis. January.

U.S. Fish and Wildlife Service. 1992. Endangered and Threatened Wildlife and Plants; Final Rule to List the Plant *Spiranthes diluvialis* (Ute-Ladies' Tresses) as a Threatened Species. Federal Register 57(12): 2048-2054.

U.S. Fish and Wildlife Service. 2007. Yellow-billed Cuckoo, Western Distinct Population Segment. U.S. Fish and Wildlife Service, Species Assessment and Listing Priority Assignment Form, Sacramento Field Office, Sacramento, California.

U.S. Fish and Wildlife Service. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia.

U.S. Fish and Wildlife Service. 2009a. Endangered and Threatened Wildlife and Plants; Final Rule To Identify the Northern Rocky Mountain Population of Gray Wolf as a Distinct Population Segment and To Revise the List of Endangered and Threatened Wildlife. Final Rule. Federal Register - 74(62):15123-15188.

U.S. Fish and Wildlife Service. 2009b. Region 6 Environmental Contaminants: Contaminant Issues – Industrial Wastewater Impoundments. Accessed online: http://www.fws.gov/mountain-prairie/contaminants/contaminants3.html.

U.S. Fish and Wildlife Service. 2010a. General Provisions; Migratory Bird Revised List and Permits; Final Rule. Federal Register 75(39):9282-9314.

U.S. Fish and Wildlife Service. 2010b. Endangered and Threatened Wildlife and Plants; 12-Month Findings for Petitions to List the Greater Sage-Grouse (*Centrocercus urophasianus*) as Threatened or Endangered; Proposed Rule.

U.S. Fish and Wildlife Service. 2013a. Wyoming Ecological Services GIS Data: Section 7 Range Data. Available online at: http://www.fws.gov/wyominges/Pages/WYES_GISdata.html.

U.S. Fish and Wildlife Service. 2013b. Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*). Federal Register 78(192):61622-61666.

U.S. Fish and Wildlife Service. 2013c. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, Colorado. February 2013.

U.S. Fish and Wildlife Service. 2014a. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*); Final Rule. Federal Register 79(192):59992-60038.

U.S. Fish and Wildlife Service. 2014b. Greater Sage-Grouse: Additional Recommendations to Refine Land Use Allocations in Highly Important Landscapes. Letter to Bureau of Land Management Director. October 27.

U.S. Geological Survey. 2001. OFR 2001-1352, Engineering Aspects of Karsts.

U.S. Geological Survey. 2006. Wyoming Rare Plant Field Guide. Northern Prairie Wildlife Research Center. Accessed online: http://www.npwrc.usgs.gov/resource/plants/wyplant/index.htm.

U.S. Geological Survey. 2008. Wyoming Seismic Hazard Map, National Seismic Hazard Mapping Project.

U.S. Geological Survey. 2010a. Quaternary Fault and Fold Database; Reston, Virginia.

U.S. Geological Survey. 2010b. USGS 06639000 Sweetwater River Near Alcova, Wyoming; National Water Information System: Accessed online: http://nwis.waterdata.usgs.gov/wy/nwis/inventory/?site_no=06639000&.

U.S. Geological Survey. 2013. National Hydrography Dataset, Watershed Boundary Dataset. Accessed online: http://nhd.usgs.gov/wbd.html. May.

U.S. Geological Survey. 2014. West Nile Virus Mosquito. USGS-Disease Maps Online: http://diseasemaps.usgs.gov/wnv_wy_mosquito.html.

U.S. Geological Survey. 2015. National Water Information System: Web Interface. Peak Streamflow for the Nation. USGS 06638300 West Fork Crooks Creek near Jeffrey City, Wyoming. Accessed online: http://nwis.waterdata.usgs.gov/nwis/peak?site_no=06638300&agency_cd=USGS&format=html. May.

U.S. National Climate Assessment (NCA). 2014a. Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

U.S. National Climate Assessment. 2014b. Shafer, M., D. Ojima, J.M. Antle, D. Kluck, R.A. McPherson, S. Petersen, B. Scanlon, and K. Sherman, 2014: Ch. 19: Great Plains. Climate Change Impacts in the United States: The Third National Climate Assessment, J. M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, 441-461. doi:10.7930/J0D798BC. Accessed online: http://nca2014.globalchange.gov/report/regions/great-plains.

Van Houten, F.B. 1964. Tertiary Geology of the Beaver Rim Area, Fremont and Natrona Counties, Wyoming; U.S. Geological Survey Bulletin 1164, pgs. 18-78.

Visibility Information Exchange Web System (VIEWS). 2012. Regional Haze Rule Summary Data. Means for Best, Middle, and Worst 20% Visibility Days. Accessed online: http://vista.cira.colostate.edu/views/Web/IMPROVE/SummaryData.aspx. October 2011.

Walker, B.L., D.E Naugle, K.E. Doherty, and T.E. Cornish. 2007. West Nile Virus and Greater Sage-grouse: Estimating Infection Rate in Wild Bird Population. Avian Diseases 51(3):691-696.

Walters, S. 2012. Riverton Volunteer Fire Department Captain. Personal Communication with Edge Environmental, Inc. January 2.

Welder, G.E. and L.J. McGreevy. 1966. Groundwater Reconnaissance of the Great Divide and Washakie Basins and Some Adjacent Areas, Southwestern Wyoming; U.S. Geological Survey Atlas HA-219.

West, N.E. 1988. Intermountain Deserts, Shrub Steppes, and Woodlands. Pages 209-230, in M.G. Barbour and W. D. Billings (Editors). North American Terrestrial Vegetation. Cambridge University Press. New York, New York.

Western Regional Climate Center (WRCC). 2013. Historical climate data for Jeffrey City, Wyoming. Accessed online: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?wyjeff. May 2013.

Whisenant, S.G. 1990. Changing fire frequencies on Idaho's Snake River Plains: ecological and management implications. US Department of Agriculture, Forest Service, Intermountain Research Center, General Technical Report INT–276, Logan Utah, USA.

Whitson, T.D. (editor) et al. 1996. Weeds of the West. Western Society of Weed Science in cooperation with Cooperative Extension Services, University of Wyoming. Laramie, Wyoming.

Whittington, D.M. and G.T. Allen. 2008. Guidelines for Raptor Conservation in the Western United States. U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.

Whitcomb, H.A. and M.E. Lowry. 1968. Groundwater Resources and Geology of the Wind River Basin Area, Central Wyoming. U.S. Geological Survey Hydrologic Atlas HA-270.

Wind River Visitors Council. 2013. Tribal population estimates. Accessed online: www.windriver.org/info/communities/reservation.php.

Wiseman, S. 2014. Traffic Control Division, Wyoming Department of Transportation. Personal Communication with Edge Environmental, May 6.

Wyoming Attorney General. 2005 – 2011. Division of Criminal Investigation. Crime in Wyoming-Annual Reports for Years 2005 through 2011. Accessed online: http://wyomingdci.wyo.gov/dci-criminal-justice-information-systems-section/uniform-crime-reporting.

Wyoming Department of Administration and Information (WDAI). 2013a. Demographic Information – Wyoming Population Estimates and Forecasts. Release Date: May 2013. Accessed online: http://ai.state.wy.us.

Wyoming Department of Administration and Information. 2013b. Wyoming Housing Information – Annual Residential Building Permits for Wyoming and Counties. Accessed online: http://eadiv.state.wy.us/housing/housing.html.

Wyoming Department of Education. 2014. Wyoming School District Statistical Report Series #2. Statistical Reports for Years 2000 through 2013. Accessed online: edu.wyoming.gov/DataInformationAndReporting/StatisticalReportSeries2.aspx.

Wyoming Department of Environmental Quality (WDEQ). 1984. Water Quality Rules and Regulations. Water Quality Division.

Wyoming Department of Environmental Quality. 1994. Land Quality Division. Guideline No. 1 Topsoil and Overburden. August.

Wyoming Department of Environmental Quality. 1997. Land Quality Division. Guideline No. 2. Vegetation. November.

Wyoming Department of Environmental Quality. 2003. Land Quality Division. Guideline No. 6 Application for a Permit to Mine or Amendment. January.

Wyoming Department of Environmental Quality. 2004. Land Quality Division. Guideline No. 15 Alternative Sediment Control Measures. January.

Wyoming Department of Environmental Quality. 2012a. Wyoming Water Quality Assessment and Impaired Waters List, 2012 Integrated 305(b) and 303(d) Report. EPA approval date: May 2012. Accessed online: http://deq.state.wy.us/wqd/watershed/#/Assess.

Wyoming Department of Environmental Quality. 2012b. Wyoming's Water Quality Rules and Regulations: Chapter 17; Storage Tanks. December.

Wyoming Department of Environmental Quality. 2013. Wyoming's Water Quality Rules and Regulations: Chapter 1; Wyoming's Surface Water Quality Standards.

Wyoming Department of Environmental Quality. 2014. Background pollutant concentration data provided by the Wyoming Department of Environmental Quality Air Quality Division, January 2014.

Wyoming Department of Environmental Quality. 2015a. Land Quality Division. Permit to Mine 381C.

Wyoming Department of Environmental Quality. 2015b. Water Quality Division. WYPDES Permit WY0095702. October 15. http://deq.state.wy.us/wqd/WYPDES_Permitting/WYPDES_PNs_and_appr_permits/FinalPermits_Apps/FP_0094001-0099000/WY0095702_fp_NEW-energyfuels-10-5-15.pdf.

Wyoming Department of Environmental Quality. 2015c. Air Quality Permit No. P0015550. Issued July 6.

Wyoming Department of Environmental Quality. 2015d. Wyoming's Water Quality Rules and Regulations: Chapter 8; Quality Standards for Wyoming Groundwaters. September.

Wyoming Department of Revenue. 2009. *2009 Annual Report*. Accessed online: http://revenue.state.wy.us.

Wyoming Department of Revenue. 2010. 2010 Annual Report. Accessed online: http://revenue.state.wy.us.

Wyoming Department of Revenue. 2011. 2011 Annual Report. Accessed online: http://revenue.state.wy.us.

Wyoming Department of Revenue. 2012. 2012 Annual Report. Accessed online: http://revenue.state.wy.us.

Wyoming Department of Revenue. 2013. Excise Tax Division. Sales/Use and Lodging Tax Rates by Locality, Effective October 1, 2013. Accessed online: http://revenue/wy/gov/Excise-Tax-Division.

Wyoming Department of Transportation (WYDOT). 2011. WYDOT 2010 Vehicle Miles Book. Accessed online: www.dot.stte.wy.us/wydot/planning_projects/Traffic_Data.

Wyoming Department of Transportation. 2012a. WYDOT 2011 Vehicle Miles Book. Accessed online: www.dot.state.wy.us/home/planning_projects/Traffic_Data.default.html.

Wyoming Department of Transportation. 2012b. Your Life and Wyoming's Wildlife Both Worth Saving. Wyoming Department of Transportation, Highway Safety Program, Cheyenne, Wyoming.

Wyoming Department of Transportation. 2013. Wyoming Comprehensive Report on Traffic Crashes for Years 2004 – 2012. Accessed online: www.dot.state.wy/us/home/dot_safety/ safety_statistics.html.

Wyoming Department of Transportation. 2014. Wyoming's 2012 Report on Traffic Crashes. Accessed online: www.dot.state.wy.us/home/dot_safety/safety_statistics/2012-traffic-crash-information.html.

Wyoming Department of Workforce Services (WDWS). 2010. Research and Planning. Wyoming Labor Market Information. Commuting in Wyoming 2004Q1 to 2009 Q3. Accessed online: http://wydoe.state.wy.us/lmi/commute.htm.

Wyoming Department of Workforce Services. 2012. Research and Planning. Wyoming Labor Market Information. Commuting in Wyoming 2005Q1 to 2011Q3. Accessed online: http://wydoe.state.wy.us/lmi/commute.htm.

Wyoming Game & Fish Department (WGFD). 2003 to 2012, Annual Reports of Big and Trophy Game Harvests. Cheyenne, Wyoming.

Wyoming Game & Fish Department. 2004. Lander Region Angler News. Spring 2004. Accessed online: https://wgfd.wyo.gov/web2011/Departments/Fishing/pdfs/LR_ANGLERNEWS_20040001936.pdf. Accessed on March 12, 2014.

Wyoming Game & Fish Department. 2009. Atlas of Birds, Mammals, Amphibians, and Reptiles in Wyoming. Wyoming Game and Fish Department, Cheyenne, Wyoming. Accessed online: http://gf.state.wy.us/wildlife/nongame/index.asp.

Wyoming Game & Fish Department. 2010. Recommendations for Development of Oil and Gas Resources within Important Wildlife Habitats. Version 6.0. Wyoming Game and Fish Department, Cheyenne, Wyoming.

Wyoming Game & Fish Department. 2011. Letter from John Emmerich, Deputy Director to Kristin Yannone, Project Manager in response to public scoping. October 6.

Wyoming Game & Fish Department, National Park Service, USDA-APHIS-Wildlife Services, and U.S. Fish and Wildlife Service. 2015. 2014 Wyoming Gray Wolf Population Monitoring and Management Interim Report: January 1, 2014 through September 23, 2014. Cheyenne, Wyoming.

Wyoming Housing Database Partnership (WHDP). 2014a. The 2013 Wyoming Profile of Demographics, Economics, and Housing. Sponsored by the Wyoming Community Development Authority. Final Report. Volume 1. February 28.

Wyoming Housing Database Partnership. 2014b. The 2014 Wyoming Housing Needs Forecast. Sponsored by the Wyoming Community Development Authority. Final Report. March 16.

Wyoming Natural Diversity Database (WYNDD). 2003. Research from the Glisson report regarding *Physaria saximontana* Rollins var. *saximontana* (Fremont County twinpod).

Wyoming Natural Diversity Database. 2016. Summary Spredsheet and Shapefiles for T28NR92W. Accessed online: http://www.uwyo.edu/wyndd/_tools/species-by-township/.

Wyoming Oil and Gas Conservation Commission (WOGCC). 2013. Well and production files, by location. Accessed online: http://wogcc.state.wy.us/. May.

Wyoming State Engineer’s Office (WSEO). 1910. Tenth Biennial Report of the State Engineer to the Governor of Wyoming – 1901-1910. The S.S. Bristol Co., Printers and Binders.

Wyoming State Engineer's Office. 1974, Wyoming Water Planning Program, Groundwater Potential of the Arikaree Formation in the Sweetwater Drainage (Fremont, Natrona, and Carbon Counties, Wyoming). Accessed online: http://library.wrds.uwyo.edu/wwpp/UN-Groundwater_Potential_Arikaree_Formation_Sweetwater_Drainage-1974.html. Accessed May 2015.

Wyoming State Engineer’s Office. 2013. Water Rights Database, e-Permit. Accessed online: https://sites.google.com/a/wyo.gov/seo/. November.

Wyoming Weed and Pest Council. 2011. Wyoming Weed and Pest Council website. Accessed online: http://www.wyoweed.org/index.html.

Yeo, J.J. 2009. Short-term Effects of Mechanical Shrub Treatment and Livestock Grazing Exclusion on Vegetation in a Native Wyoming Big Sagebrush Community, East-Central Idaho. Technical Bulletin 2009-2. Bureau of Land Management, Challis Field Office, Challis, Idaho.

CHAPTER 8.0
Glossary

ablation	removal of material from the surface of an object by vaporization, chipping, or other erosive processes
ad valorem	tax based on the value of real estate or personal property
agglomerate	cluster of primary particles held together by weak physical interactions
aggradation	increase in land elevation due to the deposition of sediment
alluvial fan	fan-shaped deposit formed where a fast flowing stream flattens, slows, and spreads, typically occurring at the exit of a canyon onto a flatter plain
alluvial soils	loose, unconsolidated (not cemented together into a solid rock*)* soil or sediments
anisotropic aquifer	preferential flow direction in soils and other geologic materials
APE	area in which impacts are planned or are likely to occur
aqueous	solution in which the solvent is water
aquitard	saturated, but poorly permeable, bed that impedes groundwater movement and does not yield water freely to wells
argillaceous matrix	property of aquifer systems displaying different hydrological properties in different directions
Arkosic sandstone	sandstone consisting of grains of feldspar and quartz cemented by a mixture of quartz and clay minerals
assay	testing of a metal or ore to determine its ingredients and quality
autonite	yellow-greenish fluorescent mineral with a high content of uranium
baseline	conditions existing prior to a specific activity
berm	man-made mound of earth serving as a border or barrier
biogenic	produced or brought about by living organisms
boneyard	storage area
bulkhead	structure or partition to resist pressure or shut off water
coffinite	uranium mineral

concomitant	happening or existing along with or at the same time as something else
conglomeratic	anything composed of heterogeneous materials or elements
counter current decantation (CCD)	thickener circuits used to recover soluble metal as pregnant liquor solution from ore leach residue
decline	spiral tunnel which circles either the flank of the deposit or circles around the deposit
degradation	process of declining to a lower state
cumulative effect	impact on the environment which results from the incremental impact of the action when added to other past and present actions and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions (40 CFR 1508.7) and (40 CFR 1508.25)
desert bajhada	series of coalescing alluvial fans along a mountain front
discing	to work (soil) with a disk harrow, breaking up turned soil resulting from plowing
epeirogenic uplift	broad regional upwarp of the cratonic (stable interior) portions of continents
ephemeral	flowing only during and immediately after precipitation
fluviatile	processes associated with rivers and streams and the deposits and landforms created by them
geomorphic	relating to the surface features of the earth
Geonet	International on-line services network
glucocorticoid	anti-inflammatory steroid like compounds that are produced by the adrenal system
graminoid	herbaceous plants with narrow leaves growing from the base such as grass
heap leach	process to extract precious metals, copper, uranium, and other compounds from ore via a series of chemical reactions that absorbs specific minerals and then re-separates them after their division from other earth materials
hydrologic	science dealing with the occurrence, circulation, distribution, and properties of the waters of the earth and its atmosphere
in-situ leaching	mining process used to recover minerals such as copper and uranium through boreholes drilled into a deposit
ion exchange	exchange of ions between two electrolytes or between an electrolyte solution and a complex for purification, separation, and decontamination
leasable minerals	minerals on public lands where the land is leased to individuals for their exploration and development and include fluid minerals and solid minerals
lek	area where sage grouse males gather to engage in competitive displays that may entice visiting females

lithology	study of the general physical characteristics of rocks
lixiviant	liquid medium, either acid or base in nature, used to selectively extract target metals from an ore or mineral by assisting in rapid and complete leaching
locatable minerals	minerals that may be “located” with a mining claim under the General Mining Law of 1872 and include but are not limited to gold, silver, platinum, precious gems, uranium, bentonite, chemical grade limestone, chemical grade silica sand and gypsum
loam	easily worked fertile soil consisting of clay, sand, and silt and sometimes organic
milling	process that separates uranium from other minerals in the host rock
mucking	to remove muck or dirt from a mine
mudstone	dark sedimentary rock formed from consolidated mud and lacking the layered structure of shale
NRC License Area	area that contains the uranium processing facility that would be external to the Permit to Mine 381C mine permit boundary but within the Project Area
NRC Restricted Area	area within the NRC License Area fenced with a chain link fence topped with barbed wire
palustrine	marsh or swamp
paralithic material	weakly cemented
perennial	occurring continuously throughout a year
phreatic surface	level of the water table below which all materials are considered saturated
potable	liquid suitable for drinking
potentiometric surface	hypothetical surface representing the level to which groundwater would rise if not trapped in a confined aquifer; water table in an unconfined aquifer
Precambrian	supereon in the geologic time scale that spans from the formation of earth around 4,600 million years ago to the beginning of the Cambrian Period, approximately 542 million years ago
pregnant leach solution	uranium-rich aqueous solution
radionuclide	nuclide that is radioactive
raffinate	portion of an original liquid that remains after other components have been dissolved by a solvent
reagent	substance or compound that is added in order to bring about a chemical reaction
regeneration	regeneration mixes strong sulfuric acid or strong sodium hydroxide in a regeneration mixer

residuum	substance or thing that remains or is left behind, in particular, a chemical residue
rilling	channel made by a small stream.
ripping	mechanical turning of the soil with a plow or other device
room and pillar	mining system in which the mined material is extracted across a horizontal plane, creating horizontal arrays of rooms and pillars.
sandstone	sedimentary rock consisting of sand or grains cemented together
shale	rock predominantly composed of clay-sized particle and characterized by parking along bedding planes
Schroeckingerite	yellowish secondary mineral
Scintillometer	a scientific device used to measure small fluctuations of the refractive index of air caused by variations in temperature, humidity, and pressure
scoping	an open process for determining the scope of the issues to be addressed by a study
sedimentologic	science that deals with the description, classification, and origin of sedimentary rock
sodium adsorption ratio	measure of the suitability of water for use in agricultural irrigation, as determined by the concentrations of solids dissolved in the water
solvent extraction	method for separating a substance from one or more others by using a solvent
spoils	dirt, rocks, plants removed before a resource can be mined
stratigraphy	study of rock strata, especially the distribution, deposition, and age of sedimentary rocks
straw wattles	tube-shaped erosion-control devices filled with straw, flax, rice, coconut fiber or other materials
stream channel	physical confine of a stream, consisting of a bed and stream bank
subbasin	subset of a subwatershed
subsidence	sinking or settlement of the land surface, usually related to vertical downward movement of natural surfaces, although small-scale horizontal components may be present
swell factor	ratio of the weight or volume of loose excavation material to the weight or volume of the same material in place
synclinal	sloping downward from opposite directions to meet in a common point or line
tailings	materials left over after the process of separating the valuable fraction from the uneconomic fraction of an ore

total dissolved solids	all organic and inorganic materials suspended in water that are small enough to remain in the water after filtration
transmissivity	measure of the quantity of water that an aquifer can transmit horizontally
tuffaceous	rock composed of compacted volcanic ash
tuffaceous sandstone	sandstone which contains volcanic ash
uraninite	radioactive, uranium-rich mineral and ore with a chemical composition that is largely UO_2, but also contains UO_3 and oxides of lead, thorium, and rare earth elements
uranophane	rare calcium uranium silicate hydrate mineral that forms from the oxidation of uranium bearing minerals
watershed	land area that drains into a stream; the watershed for a major river may encompass a number of smaller watersheds that ultimately combine at a common point
yellowcake	product of the uranium extraction process; a stable uranium concentrate powder obtained from leach solutions, in an intermediate step in the processing of uranium ores, and commonly assayed as pounds U_3O_8 equivalent

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Appendix 1-A
BLM Response to DEIS Public Comment

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
1	U.S. Fish and Wildlife Service	2	2-62		Table 2.4-1	Table 2.4-1 Summary of Applicant Committed Measures and Mitigation Measures, page 2-62, indicates that ponds will be covered with bird balls to deter waterfowl. The FEIS should provide the surface area of the ponds and why the use of bird balls, rather than other exclusion measures such as netting, is proposed for this use. The FEIS should clarify the routine measures for upkeep of the bird balls on the ponds (e.g. when the wind blows will the balls continue to cover the surface of the ponds and will there be routine replacement of balls that are blown off the ponds). It should also be noted in the FEIS that if migratory bird mortality occurs, the U.S. Fish and Wildlife Service's Office of Law Enforcement must be contacted.	Figure 2.3-1 shows the location and approximate size of the raffinate, collection, and holding ponds. Additional information has been added to Section 2.3.3.7.2 to indicate the size of the proposed ponds as follows: Raffinate Pond (approximately 1.01 acres), Collection Pond (approximately 1.48 acres), and Holding Pond (approximately 5.35 acres). The monitoring and efficacy of the use of bird balls is discussed in Table 2.4-1 and Section 4.3.4.4.1. The following language has been added to Section 2.3.3.7.2 Treatment Ponds "The ponds would be covered with bird balls to deter waterfowl. Energy Fuels believes netting the pond is not possible due to the large size." Section 4.3.4.4.1 states "Any migratory bird mortality would be reported to the FWS Office of Law Enforcement".
2	U.S. Fish and Wildlife Service	3	3-44		3.2.5.1	**Section 3.2.5.1 Surface Water,** page 3-44, states "Surface water samples collected from impounded sites (McIntosh Pit and Western Nuclear Pond) within the Project Area demonstrate poor quality as compared to Crooks Creek..." **Section 3.2.5.3 Water Use,** page 3-49, states "Cattle often frequent the Project Area and drink from surface waters within the Western Nuclear Pond..." **Section 3.3.5.3 Migratory Game Birds, page 3-81**, states "Green-winged teal (*Anas carolinensis*) and common mergansers (Mergus merganser) were seen on the Western Nuclear Pond, which is likely utilized by other waterfowl..." **Section 3.3.5.5 Fisheries, page 3-81,** states "WGFD have stocked the Western Nuclear Pond with brook trout (*Salvelineus fontinalis*) and rainbow trout (*Onchorhynchus mykiss*) annually since 1990...Sampling was conducted in June 2013 which yielded brook trout, largemouth bass, rainbow trout, white suckers (*Catostomus commersonii*)..." noting that fish are present in the pond. Since Western Nuclear Pond is described as an enclosed impoundment, evaporation will continue to concentrate elements present in the water and, over time, can lead to adverse effects to wildlife using this pond, particularly migratory birds. It is unclear if the Project will affect the water quality of Western Nuclear Pond. If the Project will affect the water quality, the FEIS should discuss plans for collecting future water samples and steps taken to prevent further water quality degradation. If further degradation of water quality occurs, a discussion on potential effects to aquatic birds, bats, and other wildlife that may drink and feed from the pond, ways to prevent effects to wildlife, and plans to improve water quality, is needed.	No impacts to Western Nuclear Pond are anticipated as a result of the Proposed Action (see Section 4.2.5.1.1). .Improvements to Western Nuclear Pond are being conducted under the WDEQ-AML Project 16-O. The text has been updated to include references to WDEQ-AML Project 16-O.
3	U.S. Fish and Wildlife Service					Additionally, since our original comments on the PDEIS for this Project, a Presidential Memorandum-Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators-was issued by President Barack Obama on June 20, 2014, as a directive to take new steps to reverse pollinator losses. Seed mixes for reseeding should not just focus on forage species but should also include native species that serve pollinators.	The following language was added to Section 4.3.2.2.1 in Chapter 4: "As a directive to take new steps to reverse pollinator losses, on June 20, 2014, President Barack Obama issued a Presidential Memorandum – Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators as a directive to take new steps to reverse pollinator losses. Compliance with this memorandum would help to reverse pollinator losses. The following was added as a BLM Proposed Mitigation Measure: "VEG-8: The Presidential Memorandum-Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators (June 20, 2014) will be complied with (VEG-8 in Table 2.4-1). The measure was added to Table 2.4-1 in Chapter 2 of the FEIS. Also, see Section 2.3.5.9 for a discussion on the proposed seed mix by Energy Fuels (revised by Energy Fuels Comment Letter on the DEIS) which includes Sainfoin, a known native species that serves pollinators.

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4	National Park Service		3-2		Last Paragraph	The Lander RMP identified a National Trail Management Corridor for the protection of trails and their setting where setting is part of the nature and purpose of the Trails. Accordingly, the environmental impacts to the Congressionally designated trails from any of the alternatives will not be analyzed." This statement does not make sense. Why were the trails not analyzed? I imagine this is true because the project is outside of the National Trail Management Corridor, so we simply need to state that.	The text in Chapter 3 Section 3.1 was revised to read as follows: "The Lander RMP (BLM, 2013a) established a National Trail Management Corridor (NTMC) with protections for the viewshed and setting of the NHTs. The boundaries of the NTMC were established based on a viewshed analysis of what can be seen from the NHTs. The proposed project is outside of the NTMC. The RMP also limits projects outside of the NTMC if they are "highly visible" and/or "out of scale" with the surrounding environment (Decision 7008). The BLM determined that no alternative in the RMP would meet the conditions of Decision 7008 so no further analysis of impacts to the NHTs under any alternative was deemed necessary. The BLM performed a viewshed analysis specific to this project. The majority of the project is not visible from the NHTs, and the small portion that is visible is within existing disturbance, resulting in no visual impacts to the NHTs.
5	Representative Lloyd Charles Larsen House District 54					General Letter of Support	Comment Noted.
6	Jim Robinson					We spend and have spent many days camping in the basin south of sheep mountain since the last mining project back in 70s. We were Jeffrey City residents for many years. The attraction is stargazing without light pollution. When the mines were operating the light pollution was enormous. Sad to have it return.	Comment Noted.
7	Sweetwater County		1-4		1.3.2	**Conformance with Local Land Management Plans:** Insert the following text: "The Sweetwater County 2002 Comprehensive Plan calls for industrial development to occur in a manner that balances economic growth with environmental protections. Since the existing Sweetwater Mill is zoned for Mineral Development, the proposed use of the mill for this project is consistent with the Sweetwater County Comprehensive Plan. Sweetwater County encourages consideration of the following conditions: County permits, and county road licenses are obtained; A Sweetwater County Road Use, Improvement and Maintenance Agreement is approved and implemented; Project concerns are addressed with the communities of Bairoil, and Wamsutter and with the Sweetwater County Solid Waste District #2 as well as the High Desert Rural Health Care District.	Text is added to Chapter 1, Section 1.3.2, as suggested.
8	Sweetwater County		1-7		1.3.2	**Permits and Authorizations:** Add the following to Table 1.3-1 under the heading of Local Agencies on page 1-7 of the DEIS: Sweetwater County Land Use, For Sweetwater Mill site expansion, modifications: Zoning, construction and land use permits, Wyoming Statute 18-5-201 et seq; Sweetwater County Public Works Department, For access to and from the Sweetwater Mill Site: Sweetwater County Road Licenses, permits, improvement and maintenance agreements, Wyoming Statute 24-1-104; Sweetwater County Emergency Management, For Sweetwater Mill and related transportation and storage: Reporting of hazardous materials, Right-to-Know Act - EPCRA 42-116-1-01 et seq.	Text is added to Table 1.3-1 in Chapter 1, as suggested.
9	Sweetwater County					**County Road Maintenance Agreements:** Throughout the entire DEIS and Appendices, the term maintenance agreement (or variations thereof) should be changed to the term county road use, improvement and maintenance agreement. This ensures that road use and related road improvements are addressed within the required road agreement.	Text is revised in Chapter 2 Section 2.3.4.5.2, Chapter 4 Sections 4.4.6.1.1 and 4.4.6.1.2, and th

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10	Sweetwater County		7		Appendix 2-A 1.4	**Transportation Plan - Appendix 2-A: Page 7, Section 1.4, paragraph 2, last sentence:** Sweetwater County recommends that the last sentence should read: Energy Fuels will coordinate the maintenance of county roads with Fremont and Sweetwater counties based on county road agreements that will be approved prior to the start of mining.	The text in Appendix 2-A is changed to read as follows: "Energy Fuels will coordinate the maintenance of county roads with Fremont and Sweetwater counties based on county road agreements that will be approved prior to the start of mining."
11	Sweetwater County	4	4-46		4.3.4.2.2	**Speed limits:** Any reduction of speed limits on county roads must be implemented through a statutory process that requires professional engineering studies. Chapter 4, page 4-46, Section 4.3.4.2.2, fifth paragraph states, in reference to protecting sage grouse: "If off-site processing were to occur, vehicular speed limits would be reduced to limit noise produced by trucks traveling on the road during the sage-grouse breeding and nesting season." Because of statutory restrictions, Sweetwater County cautions the BLM that reducing speed limits to reduce impacts on sage grouse may be more problematic than anticipated.	W-1 in Chapter 2 Table 2.4-1 is revised to read as follows: "Energy Fuels would be required to implement procedures to ensure employees adhere to appropriate speed limits within the Project Area and on public roads outside of the Project Area where speed limits are not posted to minimize big game-vehicle collisions." The measure (W-1) has also been revised in Chapter 4 Section 4.3.5.2.1. ESA-7 in Chapter 2 Table 2.4-1 is revised to read as follows: "If off-site processing occurs, Energy Fuels would be required to implement procedures to ensure employees adhere to appropriate speed limits within the Project Area and on public roads outside of the Project Area where speed limits are not posted to limit noise produced by trucks traveling on the road during the greater sage-grouse breeding and nesting season." The measure (ESA-7) has also been revised in Chapter 4 Section 4.3.4.2.1. This clarifies the intent that the proponent would implement procedures or practices for their employees to adhere to appropriate speed limits, but the measure would not require the posting of speed limits on county roads.
12	Sweetwater County					**Weed and Dust Control:** In regard to weed and dust control, especially along county roads that are utilized by the project, Sweetwater County supports the BLM proposed mitigation measures to control weeds and dust and additional measures that may be required through the proposed road use, improvement and maintenance agreement.	Comment Noted.
13	Sweetwater County					**Current Road Conditions and Anticipated Road Improvements:** If the Sheep Mountain Project proposes to use the Sweetwater Mill for offsite processing, the following Sweetwater County roads would be utilized: Wamsutter - Crooks Gap (4-23), Minerals Exploration Road (4-63) and potentially the Bairoil Road (4-22). The following summarizes the current condition of these roads and the upgrades and additional maintenance requirements that would be required to accommodate the projected traffic. See letter for specifics.	The description of current condition of these roads is added to Chapter 3, Section 3.4.6.5 in the FEIS. The summary of upgrades and additional maintenance requirements that would be required to accommodate projected traffic on these roads is added to Chapter 4, Section 4.4.6.1.2 in the FEIS.

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14	Sweetwater County					Sweetwater County is strongly supportive of the Sheep Mountain Uranium Project and strongly believes that it will have positive socioeconomic effects for Sweetwater, Carbon and Fremont Counties. With this in mind, it is important to note that, if the Sweetwater Mill is reopened, the towns of Bairoil and Wamsutter, Sweetwater County Solid Waste District #2 and the High Desert Rural Health Care District could receive impacts that may need to be addressed.	Thank you for your support. The BLM determined that the possible impacts to Bairoil and Wamsutter and the Rural Health Care District are too speculative to analyze without more knowledge about the Sweetwater Mill or the extent staff needs to be increased; however, the socioeconomic analysis does include impact analysis for the larger population areas that could be impacted. The proponent will need to reach an agreement with Solid Waste Disposal in order to use their facilities. No change to the document.
15	Sweetwater County		2-66		Table 2.4-1	To ensure that health, safety and community service needs are addressed, Sweetwater County strongly encourages the project proponent to maintain active and open communication with these governmental entities throughout the life of the project. To integrate this comment into the DEIS, Sweetwater County recommends that, on page 2-66, Table 2.4.1, BLM Proposed Mitigation Measures for the Socioeconomic line item be amended to reflect the above comment.	The following language is added to Chapter 2, Table 2.4-1 and to Chapter 4, Section 4.4.4.2.1 as SE-1: "To ensure that health, safety, and community service needs are addressed, Energy Fuels would maintain active and open communication with governmental entities throughout the life of the Project."
16	EPA		4-25 & 4-26			**Incorporate Water Treatment into Alternatives.** As noted in several places in the DEIS (e.g., pages 4-25 & 26), the proposed mine will need to dispose of surplus water, particularly if the ore is milled off-site. Based on the water quality data from the Lidstone (2013) reports and the water quality standards and regulations for surface water discharge, mine drainage water will need to be treated before it is discharged. Because it is integral to the mine operation and relevant to assessing environmental impacts, we recommend more fully integrating the water treatment plant into the proposed alternatives (Section 2.3.11.3), including identifying likely treatment processes, pollutants of concern, and capacity. The impact analysis should also be revised to include potential impacts from the water treatment plant including chemical use and transportation and disposal of sludge, brine or other waste products.	Sections 2.3.10.3, 2.3.11, and 4.2.5.1.1 have been updated with the information on the treatment plant and associated impacts for the discharge of excess water from the Congo Pit and Sheep Underground Mine dewatering.
17	EPA		2-43		2.3.11	**Treatment Plant Capacity.** The capacity of the proposed wastewater treatment plant should be more closely evaluated. Page 2-43, Section 2.3.11 Water Management Plans notes the following dewatering rates: Congo Pit 260 gpm year , 640 gpm year 4, 330 gpm year 8 Sheep Underground 750-1000 gpm, year 1, 250-400 gpm, steady state Treatment Plant capacity 200 gpm There appears to be disconnection between the anticipated dewatering rates and the water treatment plant capacity. Although we understand that much of the water would be used for dust suppression, the mine facility needs to be also prepared for weather or operating conditions which create substantial surplus water such as during major runoff events, high snowfall years, winter weather or after temporary shutdowns.	Sections 2.3.10.3, 2.3.11, and 4.2.5.1.1 have been updated with the information on the treatment plant and associated impacts for the discharge of excess water from the Congo Pit and Sheep Underground Mine dewatering.

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18	EPA		4-25 & 4-26			**Individual WPDES Permit.** As there is a potential to discharge mine drainage (e.g., water from the mine pits, shafts, ore stockpiles and some waste rock/spoil areas), the final EIS should clarify that an individual WPDES wastewater discharge permit will be needed in addition to the WPDES industrial stormwater permit discussed most frequently in the DEIS. We do note that an individual WPDES permit is alluded to at several places in the draft EIS such as on pages 4-25 and 4-26. However, the discussion does not include enough information to determine if the future WPDES permits will provide sufficient controls to prevent the mine from causing unnecessary or undue degradation to Crooks Creek for designated water uses.	Sections 2.3.10.3, 2.3.11, and 4.2.5.1.1 have been updated with the information on the treatment plant and associated impacts for the discharge of excess water from the Congo Pit and Sheep Underground Mine dewatering.
19	EPA				Table 1.3-1	**WPDES (NPDES) Effluent Guidelines Regulations.** The permit would need to be developed to meet the more stringent of water quality standards and the effluent guidelines for uranium mining and milling at 40 CFR 440.3 developed under the Clean Water Act. The Effluent Guidelines discharge limitations are based on wastewater treatment technologies costs and removal efficiencies for specific industries. For the uranium mining and milling subcategory there are limits for chemical oxygen demand (COD), zinc, radium 226 (both dissolved and total) uranium and pH for mine drainage. No discharges from the mill would be allowed. The requirements of the effluent guidelines would be implemented through the individual WPDES discharge permit and should be factored into evaluating surface water impacts to Crooks Creek. The requirement to obtain an individual NPDES permit and comply with the Effluent Guidelines should also be added to Table 1.3-1 - Major Federal and State Laws, Regulations and Applicable Permits.	Sections 2.3.11 and 4.2.5.1.1 are updated with the information on the treatment plant and associated impacts for the discharge of excess water from the Congo Pit and Sheep Underground Mine dewatering. A reference to the WYPDES Permit for the dewatering treatment discharge has been added to Table 1.3-1.
20	EPA		2-10			**Use of Mine Drainage for Dust Suppression.** The final EIS should clarify whether untreated mine drainage from the facility will be used outside of the mine or mill areas for dust suppression or equipment washing. For example, in the last paragraph of page 2-10, the DEIS states that mine drainage from the Sheep I and Sheep II shafts could be used for dust suppression on roads, fire suppression and washing equipment. This is of concern both for water quality and under the NPDES permit regulations. Water quality data for mine drainage from the historic mine indicates that treatment will be required for several pollutants before it can be used in areas that are required under only the industrial stormwater permit or areas outside the area covered by the stormwater permit.	Energy Fuels has clarified that they would use untreated water for dust suppression where drainage is controlled, but roads or disturbances that might drain off site will use treated water for dust suppression. Language in Chapter 2 Section 2.3.4.2 has been revised to read as follows: The water could then be used for dust suppression on haul and access roads where drainage is controlled. Language in Chapter 2 Section 2.3.11.1 has been revised to read as follows: "Use of this untreated water would be limited to areas where drainage is controlled to avoid the potential for off-site drainage."

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21	EPA		4-33			**Groundwater/Surface Water Connection.** The draft EIS includes a very limited evaluation of the effects of the proposed project to groundwater quality and the subsequent impacts to surface water when the surficial groundwater discharges to Crooks Creek after the water table rebounds post mining. This appears to be one of the more important issues for determining whether the mine project will cause unnecessary or undue degradation. The EIS discussion of impacts to groundwater flow and quantity provides a starting point in identifying potential impacts from groundwater to Crooks Creek. For example, we note on page 4-31, 2nd to last paragraph the statement: "Based on the elevation of the groundwater table and the flow direction, discharge of some water from the Battle Spring Aquifer to the alluvial deposits along Crooks Creek is likely." On page 4-33, the first paragraph summarizes that the Congo Pit and Sheep underground mine would create areas of less consolidated material within the Battle Springs Aquifer increasing permeability that are likely to provide faster recharge to the groundwater system. The second paragraph on page 4-33 discusses the interconnection through permeable pathways within the Battle Spring Aquifer as a result of historic surface and underground mining as well as future mining. The impacts from potentially faster recharge were determined to be minor in the draft EIS test noted on page 4-33.	More information from Appendix D-6 of the WDEQ-LQD Permit to Mine 381C has been incorporated into Section 3.2.5.2 for easier reference, and the text modified accordingly. In particular, the geologic map and two of the hydrogeologic cross-sections from Appendix D-6 of the WDEQ-LQD Permit to Mine 381C (which were also included in the Lidstone Report) were added. The cross-sections illustrate the geologic controls on the groundwater occurrence and movement, in particular the presence of the Cody Shale. This shale is a local and regional aquitard, and as such, limits the amount of groundwater which could contribute to Crooks Creek from the Project Area. In some areas, the Cody Shale is present at the surface between the Project Area and Crooks Creek (e.g., Stephens, 1964, page F22), and in others, the shale is covered by a veneer of Quaternary deposits, which may include alluvial material. Comparison of the available, contemporaneous flow measurements conducted along Crooks Creek (included in Appendix 3-B of the FEIS and as Table D-6-9 of the WDEQ-LQD Permit to Mine 381C) indicates the increases in the flow rates in Crooks Creek from upstream to downstream locations are generally less than 15% of the flow rates, and in some cases there is no change or a reduction in the flow rate. (The one exception appears to be as a result of snowmelt contribution to the creek.) The changes in the flow along the creek can be attributed to measurement difficulties, evaporation, inflow/outflow to groundwater (from both sides of the creek), and contributions from the ephemeral tributaries to Crooks Creek. In addition, the available data does not indicate a significant variation in water quality along the creek adjacent to the Project Area or that the creek water quality adjacent to the Project Area is significantly different than the quality In Crooks Creek a few miles upstream of the Project or in the West Fork of Crooks Creek. The presence of the Cody Shale would also act as a barrier to any preferential flow paths in the Battle Spring Aquifer due to faults or mining-related pathways in the Battle Spring Formation (see Response to Comment 24, below).
21						During mining operations water quality impacts from surfacing groundwater would be a minor issue due to the substantial dewatering of surficial aquifers. However, as the groundwater table recovers post mining or during mine shutdowns, groundwater flow will rebound. The buffer of no surface disturbance within 500 feet from Crooks Creek is a good mitigation measure to protect Crooks Creek but it is not clear what that is based on and whether there may be preferential pathways such a faults that may more directly convey groundwater from the expanded mines to Crooks Creek. We recommend that the final EIS discuss the anticipated flow rates and potential water quality effects from surficial groundwater on Crooks Creek. This may be disclosed as a potential loading to Crooks Creek. The final EIS should also more fully describe the mitigation and/or reclamation measures that will be taken to protect groundwater quality or reduce poor quality groundwater flows from the mining area into Crooks Creek.	For a conservative assessment, the potential for exchange of groundwater and surface water along Crooks Creek should not be discounted entirely. However, considering the limited potential for such exchange due to geologic controls, the lack of significant changes in measured flow rates in Crooks Creek, and the lack of anticipated change to the groundwater quality, impacts to Crooks Creek are anticipated to be negligible. As discussed in Section 4.2.5.2 and 4.2.5.3, water quality monitoring is required throughout reclamation to ensure the anticipated water quality conditions are present.

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21A	EPA		3-25		Section 3.2.3	**Acid Generation/Waste Rock & Overburden Materials Needing Special Handling.** The main premise of the groundwater quality environmental analysis is that since groundwater quality has generally remained the same since the 1970s, it will continue to do so. There are several factors that indicate further analysis should be undertaken or additional mitigation measures should be more formally developed to isolate waste rock/spoils that are potentially acid generating or otherwise release pollutants including radium. First, as noted in the draft EIS in Section 3.2.3 Geologic Hazards on page 3-25, Energy Fuel's analysis determined that the rock associated with the ore zone to be of concern for radium, radon, sodium absorption ratio, boron, acid base potential, selenium and molybdenum. The second factor is existing water quality data for the site found higher metals and lower pHs in several areas. For example, piezometer (PZ-1) and several of the groundwater monitoring wells have pH values that are much lower than surrounding monitoring wells. It is not clear if these lower pH values are due to oxidation of minerals and acid generation. However, the environmental analysis of geologic chemical hazard on page 4-16 in Section 4.2.2 of the draft EIS implies that all of the rock with geologic hazards would be ore and problems could be addressed as they occur. We recommend that the final EIS estimate the potential volume of waste rock, monitoring and mitigation measures that should be developed to identify waste rock that may need special handling prior to disposal. The process for determining special handling and the levels for triggering the need for special handling should also be disclosed. The alternative should also identify waste repository locations and design practices that will be implemented to isolate problematic waste rock from surface and groundwater.	The quantities of waste rock from the Congo Pit and Sheep Underground Mine are listed in Tables 2.3-2 and 2.3-3, respectively. During mining, the temporary waste repositories for out-of-mine spoils from both the Congo Pit and Sheep Underground Mine would be the Hanks Draw Facility and South Spoils Facilities. During reclamation, the ultimate repository for the out-of mine spoils would be the Congo Pit. The exception would be for spoils that cannot be used as in-pit fill material, and that material would be used as grading fill in the existing Paydirt Pit (Sections 2.3.4.2 and 2.3.5.4 of the FEIS). The overburden sampling results for preliminary identification of unsuitable materials are summarized in Section 3.2.2.3 of the FEIS, and the sampling results, including historic and recent sampling events, are described in more detail in Section D-5.5 of Appendix D of the WDEQ-LQD 381C Permit as approved in July 2015. The measures that would be used to identify spoils requiring special handling are summarized in Section 2.3.4.2 of the FEIS and described in more detail in Section 3.8.2 of the Mine Plan in the WDEQ-LQD Permit to Mine 381C as approved by WDEQ-LQD in July 2015. The measures used during reclamation to confirm that the materials handling practices were sufficient are summarized in Section 2.3.12.5 of the FEIS and described in more detail in Section 4.4.3 of the Reclamation Plan in the WDEQ-LQD Permit to Mine 381C Permit as approved in July 2015.
21A Continued	EPA						The following language is added to Section 3.2.5.2: The relatively lower pH values and higher metal concentrations present in some wells are not considered indicative of acid generation and mineral oxidation. No correlations of the parameters generally associated with acid generation and mineral oxidation (e.g., pH, sulfate, iron, manganese, and aluminum) is apparent, and the concentrations of most metals are below laboratory detection limits. With respect to geographic distribution, the pH values in the groundwater samples from the southern portion of the property are generally, but not consistently, lower than those from the northern portion of the property. (The pH values in the northern portion of the site, north of Sheep II, range from 7.7 to 8.7, and in the southern portion of the site range from 7.0 to 8.5 with one lower value of 6.5). However, there does not appear to be any other consistent geographic distribution of other parameters. There also do not appear to be any consistent trends in the pH concentrations. The variations in the parameter concentrations are considered indicative of the complex mineralization in the subsurface materials. The language is revised to read as follows in Section 4.2.5.4.1: "The relatively rapid flooding of the backfilled pit and the underground mine after mining, and the selective handling of overburden would reduce the potential for mineral oxidation. In addition, monitoring required per WDEQ-LQD Permit to Mine 381C would provide confirmation that excessive mineral oxidation is not occurring."

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22	EPA					**Ground Water Analysis.** The groundwater analysis in the draft EIS did not have enough information to understand potential groundwater quantity and quality impacts. Fortunately, the BLM was able to send us the two Lidstone and Associates, Inc. Reports (2013a and 2013b) which filled in many of the gaps in the draft EIS surface and groundwater analysis. Similarly, the State mining permit 381C, Addendum D6-1 - Hydrology Update 2011 was also reviewed along with the draft EIS. We recommend that these documents be available as technical reports for the FEIS. The other main document that is missing is the revised mine permit 381C. We understand that the document is still being reviewed by the State of Wyoming; however, much of the environmental review and mitigation measures are based on documents which are part of the mine permit. We also recommend that the mine permit be included as a technical document for the final EIS.	For easier reference, Sections 3.2.5.1 and 3.2.5.2 have been expanded to include more of the surface and groundwater information from the documents referenced by the FEIS, including the WDEQ-LQD Permit to Mine 381C, as approved by WDEQ-LQD in July 2015 as well as other reports and publications. The documents mentioned by EPA (the Lidstone reports and the WDEQ-LQD Permit to Mine 381C) will be made available in the FEIS through publishing of the WDEQ-LQD Mine Permit.
23	EPA		2-27 & 2-70			**Portal Declines.** The level of mine design in the draft EIS is not sufficient to determine whether the portal declines have the potential to discharge water to the surface when the water table recovers after mining. It appears that ground elevations on the west side of the Congo Pit are in the same range as the 2013 water table elevation (Lidstone 2013). It is not clear if the bulkheads described on pages 2-27 and 2-70 are designed to prevent discharges to surface and groundwater. Also it is not clear if there are seasonal variations in the water table. We recommend clarifying these two issues and that additional design considerations be added to reduce the likelihood of groundwater discharging through the portal declines.	The location of the start (top) of the declines approximately coincides with the location of the Pay Dirt Pit which was reclaimed by WDEQ-AML (Maps 2.2-1 and 2.5-2). As noted on Map 4-2 in the WDEQ-LQD Permit to Mine 381C, the elevation of the start of the declines is 6,835 ft. Groundwater elevation measured in this area in 2013 is on the order of 85 ft. below the elevation of the start of the declines. The 2013 groundwater elevation of about 6,750 ft. in this area (see Map 3.2-14) is similar to the elevation measured in this area in 1979-1980 (Map D-6-4 in Appendix D-6 of the WDEQ-LQD Permit to Mine 381C). As discussed in Section 2.3.5.4 of the FEIS, the bulkheads would be used to restrict surface access and minimize the potential for mine subsidence to reach the surface (see also Map 3-13 of the WDEQ-LQD Permit to Mine 381C). The text in Sections 2.3.5.4 and 2.5 is clarified to indicate the bulkheads are to prevent access into the declines, i.e., they are not necessary to prevent groundwater discharge from the declines because of the depth to groundwater. Figure D-6-2 of Appendix D-6 in the WDEQ/LQD Permit to Mine 381C is a Time Series Plot of water levels from groundwater monitoring wells. There is no evidence of seasonal variations that would impact the water levels to the extent that the elevations in the declines would be above the ground surface. Maps 2.2-1 and 2.5-2 are revised to show the approximate location of the Paydirt Pit.

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24	EPA		3-46		3.2.5.2	**Faults.** On Page 3-46, Section 3.2.5.2, The EIS states that "It is unknown how shallow normal faults or underground mine workings within the Battle Spring Formation on Sheep Mountain may influence the groundwater in the Battle Spring aquifer. Historic mine workings and abandoned drill holes may influence communication between localized aquifers within the Project Area but has not been enumerated due to a lack of data." We recommend that the FEIS examine this unknown issue through groundwater modeling and a proposed monitoring program to begin to fill some of these critical data gaps. If needed, mitigation measures should also be specified.	The groundwater discussion in Chapter 3 Section 3.2.5.2 has been expanded and clarified. As discussed in Section 3.2.4.2, the Battle Spring and Fort Union formations are the water-bearing formations in the vicinity of the Project Area. Because of the heterogeneity of the geologic materials in these formations, the formations are difficult to distinguish and the term Project Area Aquifer is used to collectively refer to the water-bearing strata in the Battle Spring and Fort Union formations. There is also variability in the hydrogeologic properties within the formations due to lithologic variations, e.g., lenses and layers of material rather than homogenous material. The use of the phrase "local aquifers" referred to this variability, not aquifers in formations other than the Battle Spring and Fort Union formations. The synclinal structure of the Cody Shale aquitard provides a significant control on the movement of water out of these formations. The natural heterogeneity of the geologic materials in the Battle Spring and Fort Union formations is augmented by the presence of historic mining-related activities, such as underground workings. The faulting referred to in the subsection is localized, small-scale faults within the Project Area Aquifer, which also contributes to the heterogeneity within the aquifer. However, the heterogeneity does not restrict groundwater movement throughout the Project Area Aquifer, as evidenced by the consistency of the potentiometric surface before and after intervals of dewatering (e.g., Maps D-6-4 and D-6-10 in the WDEQ-LQD Permit to Mine 381C, as approved by WDEQ-LQD in July 2015.) The geohydrologic assessments have taken the effects of the natural and mining-related heterogeneities into account, and interpretation of geologic and hydrologic information continues to help improve the efficiency of dewatering for mining and of monitoring for baseline, operations, and reclamation.
25	EPA		3-43			**Crooks Creek Classification.** Page 3-43 of the draft EIS identifies the Wyoming stream classifications for Crooks Creek and Sheep Creek as Category 3 waters, with a portion of Crooks Creek classified as Category 5. The State's Surface Water Quality standards updated as of July 26, 2013, identify both Crooks Creek and Sheep Creek as Class 2AB waters. As noted in the draft EIS, Crooks Creek continues to be listed as impaired from the confluence with Mason Creek to 1.4 miles downstream due to oil and grease; however, the impaired segment continues to be classified as a 2AB water. The 2AB classification means that water quality is to be protective of additional designated uses such as drinking water, fisheries and fish consumption.	The stream classifications are updated in Section 3.2.5.1. of the FEIS.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
26	EPA		3-49			**Drinking Water and Agricultural Uses of Water.** We note on page 3-49 that there are 2 groundwater wells on-site that are permitted for domestic use, as well as 10 wells in the area of the mine that have been identified for domestic and/or livestock watering uses. We also note in Table 3.2-10 that there are a number of surface water rights in the area that are designated for domestic use, stock watering or irrigation uses; several of the diversion points for the surface rights are immediately downstream of the project area. The groundwater in the project area has also been designated as Zone 3 by the Source Water Assessment Program which identifies watersheds that could be within the capture zone of a public water supply well. The environmental consequences of the proposed action were not analyzed for local water users in the draft EIS. We recommend adding a section to the final EIS analyzing potential impacts to local water users. Depending on the magnitude of potential impacts additional monitoring may be needed. As part of this evaluation of potential impacts to domestic or agricultural water users, we recommend collecting more specific information about the water source such as well information, target aquifer, well screen interval, total depth, and water quality data.	The records of the Wyoming State Engineer's Office (WSEO) are not indicative of current uses, and the existence of a WSEO record is not indicative of whether water: can be obtained (i.e., whether a well drilled at that location would produce water); is of a quality suitable for the reported use; or has been transferred to a different use. There is no requirement that the holder of a water right update the information in the WSEO database, and such updates are generally only done when the water right holder wants to ensure the right continues to be a valid right. In some instances, the infrastructure may have never been completed to use the water. In other instances, the right lapsed for lack of use, e.g., attempts to revive an old, unused right may encounter resistance from holders of newer rights which have been continuously active. In addition, the water may be used for some purpose not specified in the original permit. For example, the two wells on-site that are permitted for domestic use, along with other uses, were originally permitted with the WSEO in the 1960s and 1970s by previous mining companies. Although groundwater may have been used briefly by these operators for water supply, any water supply infrastructure associated with the wells is no longer suitable for modern operations. As another example, a water right associated with the Paydirt Pit was reported as abandoned but subsequently used by WDEQ-AML for dewatering of the pit prior to backfilling. All the water rights and wells within the Project Area were acquired by Energy Fuels, and the water will only be put to the uses specified in the WDEQ-LQD Permit to Mine 381C. as approved by WDEQ-LQD in July 2015. WDEQ/LQD requires operators to provide the WSEO records for all surface and groundwater rights within a specified distance of the proposed operations to help ensure no existing user is overlooked; however, assessments of surface and groundwater impacts are based on the 'on-the-ground' conditions. The analysis in the EIS followed a similar approach. For example, there may be older water wells in use that were not reported to the WSEO. (No such wells are known in the proposed Project Area.) As another example, the location of the closest permanent residence is now 3 miles downstream. Another difficulty with the WSEO records is that well information, such as the well screen interval, may not be available or required to be collected at the time the well was installed. In general, the older the record, less information is available and that information may not be reliable or updated.
26 Continued							Section 3.2.5.3 is revised for clarity and incorporates more information, the associated tables and maps have been updated, the maps are included with the text, and the table are in Appendix 3-C. Section 4.5.2.7 has been updated to include information from the evaluation of Probable Hydrologic Consequences in the WDEQ-LQD Permit to Mine 381C and considers the Zone 3 designation by the Source Water Assessment Program.
27	EPA				Appendix 2-B	**Mine Water Monitoring Plan.** Appendix 2-B of the draft EIS briefly describes Energy Fuels monitoring plan. It would be helpful to attach a more complete water monitoring plan as an appendix or technical report to the final EIS. We also recommend that the monitoring plan identify who will be conducting the monitoring. We assume the agency column denotes the agency(s) that will be reviewing the monitoring data. We note that several monitoring locations are to be monitored only annually which does not seem to be sufficient to identify trends and seasonal variations. We recommend a minimum sampling frequency of quarterly.	Table 1 in Appendix 2-B and the text in Section 2.3.12.3 is updated to reflect the requirements of the WDEQ-LQD Permit to Mine 381C as approved by the WDEQ-LQD in July 2015, which includes quarterly sampling requirements and additional wells.

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28	EPA		2-46		Map 2.3-3	**Additional Monitoring Locations.** In evaluating the monitoring and sample location Map 2.3-3 on page 2-46; it is unclear if the PZ-7 and MW-7 are located sufficiently downstream to monitor the effects of the Hanks Draw Spoils pile. We recommend adding groundwater and surface water monitoring points down gradient of the spoils pile. We also recommend adding a monitoring point for Sheep Creek, to determine if any faults or other preferential path for groundwater are impacting the Creek.	In response to comments from WDEQ-LQD, Energy Fuels has recently updated the proposed groundwater monitoring locations, including installation of new wells and surface water monitoring locations downgradient of the Hanks Draw Spoils pile. The FEIS is updated for consistency with the WDEQ-LQD Permit to Mine 381C, in particular, Table 1 in Appendix 2-B is updated, Map 3.2-12 is added, and the corresponding text updated. Because of geologic controls, specifically the presence of a thick sequence of Cody Shale to the northeast of the Project Area, the installation of a monitoring point for Sheep Creek to determine if a preferential path for groundwater flow is not considered necessary. As discussed in response to the comment on Groundwater/Surface Water Connection, a map and cross-sections from the WDEQ-LQD Permit to Mine 381C are included in the FEIS for easier reference. These help illustrate the extent of the Cody Shale, which is a local and regional aquitard.
29	EPA					**Fish Pond.** We recommend adding water quality and potentially fish monitoring for the Fish Pond (Western Nuclear Pond) located on the south edge of the project area, southeast of the McIntosh Pit. Although, the groundwater and surface water technical reports prepared by Lidstone indicate that Fish Pond water quality was unlikely to be affected by the proposed mine, the pond is used as a recreational fishery. Because of direct human consumption of the fish, we recommend adding precautionary monitoring.	The drainage which supplies Western Nuclear Pond collects surface water from over 2,000 acres to the southeast of, upgradient of, and outside the Project Area disturbance (see Chapters 3 and 4 and Map 3.2-11). In addition, most of this drainage area was not disturbed by historic mining activities. Therefore, sampling of the pond, or fish in the pond, is not considered necessary as part of the assessment of the Project impacts. Water quality data is available from sampling of the pond (Table 6 in Appendix 3-B); therefore, baseline information is available should some unforeseeable event related to the Project potentially impact the pond. No change to the document.
30	EPA					For projects regulated by multiple agencies and for those with complex environmental impacts, we recommend more fully describing the applicable controls (e.g., permits), mitigation and monitoring measures that will be implemented through: the Wyoming mining and other permits, the BLM Plan of Operations, the BLM Record of Decision, the NRC license and the DOE legacy site management program. We would recommend adding a table or separate section to the final EIS which lists the: Permits, license, plans, Record of Decision, etc. that include controls and mitigation measures for the project (e.g. Storm Water Pollution Prevention Plans, WPDES and mining permits); The types of mitigation and control measures, (e.g., design requirements, monitoring, reporting, inspections, permit limits, performance criteria, management practices); Note whether the controls and/or mitigation measures are mandatory or recommended/voluntary; Monitoring and reporting requirements and the agency receiving the information; Identify the Lead agency for enforcing the measures and/or other follow-up actions.	Table 2.4-1 describes the applicant committed measures and the proposed BLM mitigation measures (under the BLM Mitigation Alternative) and has been updated to include an overview of the permitting requirements and agencies involved; permit numbers, if available; and more specific references to where the requirements can be found in the permit. Table 1.3-1 includes a list of permits/approvals that are required for the Project by agency.

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31	EPA		2-52			**Trigger Levels and Corrective Actions.** The discussion of mitigation measures should also summarize or reference the procedures that would be used if "operational monitoring detects conditions in excess of expected or permitted levels considering background conditions and variability" [Page 2-52, draft EIS]. If the trigger levels and corrective actions have already been defined through the Wyoming mining permit or other mechanisms, then procedures should be included or referenced in the final EIS. Some examples of how to identify important trigger levels and corrective action procedures include: Groundwater - What are the water quality criteria that sample results will be compared against? If those criteria are exceeded what happens: additional sampling, groundwater pumping and treatment, and/or corrective active or operational controls? Storm water - What procedures will be in place when mine site stormwater ponds may need to discharge? A contingency plan might include: Monitoring freeboard, evaluating projected weather conditions and snowpack, Pond maintenance procedures, and Sampling of water quality to determine if treatment is needed prior to discharge.	As mentioned by the commenter, many of the issues of concern have standards for which would be compared to establish appropriate trigger levels by agencies for which these standards were set and enforceable by. The purpose of the EIS standpoint is to disclose impacts, and when those impacts may indicate that unnecessary of undue degradation is inevitable, the BLM would require mitigation measures such as those described under the BLM Mitigation Alternative for those resources that the BLM has jurisdiction to regulate; therefore, the measures described in the BLM Mitigation Alternative are revised or otherwise further clarified (in Chapter 4) to establish thresholds or standards from which to compare as appropriate under the BLM's purview. See Response to Comment 30, above.
32	EPA				2.3.5.11	Evaluation of Reclamation Success. This Section discusses the reclamation conditions of the WDEQ-LQD permit 381C for the existing and proposed mines. We recommend that the Section be clarified in the final EIS to discuss which mining areas are under permit 381C. From the draft EIS we understand that the state Abandoned Mine Lands program will be completing reclamation for the McIntosh Pit but it is unclear if the other mines on Sheep Mountain have been successfully reclaimed.	The mining and reclamation at the site have been conducted under a variety of regulatory programs, ranging from essentially none (pre-law) through the current regulatory requirements (Section 2.2.2.2). The definition of 'successful' reclamation has also changed with the regulatory requirements, ranging from simple reduction of the slopes of spoil piles to current criteria for parameters such as post-mine topography, vegetation, and drainage. In general, an operator is not responsible for disturbance created by previous operators in a given area, unless the operator redisturbs that area. For pre-law sites, the WDEQ-AML may become involved to eliminate safety hazards, repair environmental damage, and mitigate risks associated with a site to the extent funds are available and in accordance with the 'hazard priority' of the site. Therefore, the 'reclamation requirements' at each AML site are tailored to the priority of the work at the site. Section 2.3.5.11 (Reclamation) is applicable to the proposed activities. Even if none of the proposed activities were approved, Energy Fuels would still have reclamation responsibilities under the WDEQ-LQD Permit 381C. These responsibilities are described in Section 2.5 (No Action Alternative). Map 2.5-1 in Section 2.5 delineates the areas of Energy Fuels' reclamation responsibilities under the Permit 381C, and Map 2.5-2 delineates areas that are essentially 'pre-law' (no reclamation requirements) and areas reclaimed by previous operators at the site under older regulatory programs or by WDEQ-AML. (This information is also included in Section 2.5.3 of the WDEQ-LQD Permit to Mine 381C). The text in Sections 2.2.2.2 and 2.3.5.11 is clarified, and a cross-reference to Section 2.5 is added.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
33	EPA				2.3.5.11	Section 2.3.5.11 also mentions that groundwater will need to be returned to pre-mining water quality. We agree that is an excellent goal for aquifers which can be used for drinking water and are tributary streams with aquatic life standards. However, we think that it could be a challenging goal depending on how "pre-mining groundwater quality goals" have been defined. Is the goal to return groundwater quality to current water quality or is the goal to clean up water to estimated conditions prior to any mining, circa 1940? We recommend that the final EIS clarify the groundwater cleanup goals and how the goals were determined. If available, the specific cleanup goals should be included with the final EIS. We note that groundwater in the two uppermost aquifers in the vicinity of the proposed project are considered as potential underground sources of drinking water based up the criterion of 10,000 mg/L TDS.	Per Chapter 8, Section 4 of the WDEQ-WQD Rules and Regulations, groundwaters of the State are classified in order to apply standards to protect water quality. The WQD classification system applicable to most groundwater is based on water quality criteria appropriate to designated uses, including Classes I (Domestic), II (Agricultural), III (Livestock), and IV (Industrial). Based on conditions throughout Wyoming and available water quality data from the Project Area, the presence of mineralized zones, such as those within the Project Area Aquifer, result in considerable variation in the concentrations of some parameters, particularly uranium and radium, within an aquifer. In general, the elevated concentration of uranium and radium result in a Class IV designation of the water in this subbasin. The baseline groundwater quality data presented in the WDEQ/LQD Permit to Mine 381C, as approved by WDEQ-LQD in March 2015, will be submitted to WDEQ-WQD for a determination of the Class of Use, and the criteria associated with this Class of Use will be the basis for evaluation of the water quality during reclamation. The text in Sections 2.3.5.11, 3.2.5.2, and 4.2.5.4 is clarified.
34	EPA				2.3.5.11	We recommend that the final EIS include additional information on the relationship between long term care and reclamation between the BLM and the State LQD mining permit and the NRC license and DOE legacy long-term care [Reclamation Overview Section 2.3.5.1]. We have listed below several questions about the relationship between the agencies' reclamation and post closure activities that we recommend be addressed in the final EIS: Will there be any DOE involvement with post closure maintenance of the mine including the pit, spoils piles and or storage areas? Is it correct that the DOE legacy site program only applies to the NRC regulated portions of the facility such as the ore processing mill or heap leaching facility? Or could additional areas of the historic or proposed mining sites be proposed for the legacy program if certain conditions are present? Are there any legacy areas in the Sheep Mountain/McIntosh Mine areas currently designated for DOE control?	As noted in Sections 2.3 and 2.3.5.12 of the FEIS, the DOE would only become involved in post-closure management of a portion of the site, specifically the NRC License Area, if the Ore Processing Facility were constructed on-site, which would require establishment of the NRC License Area, and the State of Wyoming deferred the post-closure management to DOE. Authorization for DOE involvement at the site is through Title II of The Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (Public Law 95-604, 42 USC 7901, Title II, §§201-209. The UMTRCA provision which allows for state management of a site is in §202(b). No areas within the Project Area are currently designated for DOE control. The text in Sections 2.3, 2.3.5.11, and 2.3.5.12 is clarified, and the DOE 2012 reference added.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
35	EPA		4-22		4.2.4.3	**Top Soil.** Page 4-22, Section 4.2.4.3 No Action Alternative - This section mentions the activities that would be conducted under Energy Fuels' reclamation plan in the WDEQ-LQD Permit to Mine 381C application revision and the WDEQ-AML reclamation plan that would be implemented to restore previously disturbed areas. We recommend that the final EIS examine whether there is enough available topsoil resource to achieve reclamation performance standards for both the WDEQ-LQD 381C Permit to Mine application revision and the WDEQ-AML reclamation plan.	Four considerations are needed in reference to the phrase "enough topsoil": First, WDEQ-AML is charged with eliminating safety hazards, repairing environmental damage, and mitigating risks associated with a site to the extent funds are available and in accordance with the 'hazard priority' of the site. Therefore, the 'reclamation requirements' at each AML site are tailored to the priority of the work at the site. At the McIntosh Pit, the emphasis is on backfill and stabilization of the pit. However, WDEQ-AML will be using four of the existing topsoil stockpiles from previous mining activities during their work at the McIntosh Pit. The reclamation requirements are those written into the contract for the work. Second, because of the historic site disturbance, the WDEQ-LQD reclamation requirements take into account: - the extent of the historic disturbance; - the regulatory requirements at the time the historic disturbance occurred; - the party(ies) responsible for the historic disturbance; - the availability (if any) of topsoil salvaged prior to that disturbance; and - what historic disturbance will be redisturbed. In general, operators are not responsible for reclamation of historic disturbances they did not create and are not planning to redisturb. As discussed in the response to the previous comment on Evaluation of Reclamation Success, Map 2.5-1 in Section 2.5 of the FEIS delineates the areas of Energy Fuels' reclamation responsibilities under WDEQ-LQD Permit to Mine 381C, and Map 2.5-2 in the FEIS delineates the areas that are essentially 'pre-law' (no reclamation requirements) and the areas reclaimed by previous operators under older regulatory programs. (This information is also included in Section 2.5.3 of the WDEQ-LQD Permit to Mine 381C).
35 Continued							Third, in the event sufficient topsoil is not available due to lack of topsoil salvage during historic operations or due to the presence of rock outcrops in areas to be mined, suitable material (coversoil) can be used as a substitute for topsoil (WDEQ Non Coal Rules and Regulation, Chapter 3, Section 2(c)(iii)). Section 3.6 of the Mine Plan in the WDEQ-LQD Permit to Mine 381C discusses in more detail the available quantities of suitable material (Table 3-12). Fourth, three sources of topsoil or other suitable plant growth material (coversoil) have been identified for salvage and protection within the Project area: existing topsoil stockpiles; topsoil to be salvaged from previously undisturbed portions of the site that will be disturbed for this Project; and coversoil from portions of the site that will be disturbed for this Project. Based on these considerations, Energy Fuels has determined that, exclusive of coversoil, the average topsoil replacement depth would be about 7 inches, and that depth could double depending on the amount of suitable coversoil. The soil studies and calculations used to determine salvage and replacement depths are detailed in the WDEQ-LQD Permit to Mine 381C (Appendix D-7 and Section 3.6 of the Mine Plan, respectively.) The text in Sections 2.3.3.2 and 4.2.4.1.1 of the FEIS is revised to provide additional information and cross-references to the WDEQ-LQD Permit to Mine 381C. If the On-Site Ore Processing Facility were constructed, a similar analysis of topsoil and coversoil quantities would be completed as part of the NRC review process. The topsoil and coversoil replacement would take into account the area of the Heap Leach Pad which would be reclaimed for long-term protection (e.g., radon barrier and erosion protection cap).

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
36	EPA				Appendix 3-B	**Water Quality Data in the Draft EIS.** In Appendix 3-B - Water Quality Monitoring Data, Table 5 (page 3B-5); the monitoring data from the three storm water monitoring locations (SW-1, SW-2 and SW-3) have been averaged together. We recommend that the data be presented separately for each storm water monitoring location so that the reader can determine if different storm drainage areas have different water quality.	Table 5 in the DEIS is separated into Tables 6 and 7 in the FEIS. Table 6 includes the information for McIntosh Pit and Western Nuclear Pond, and in Table 7, the data for Impoundments SW-1 through SW-3 is presented by impoundment. The text in Section 3.2.5.1 is updated to provide additional information about the impoundments and the associated water quality. The ponds are usually dry. Based on available sampling results, the water quality in each impoundment showed considerable variability, which would be expected given the ephemeral nature of the flows to the impoundments. In general, the highest concentrations were detected in SW-1 and the lowest concentrations were detected in SW-3. Most of the land in the drainage above SW-1 is historic disturbance; in contrast, most of the land in the drainages above SW-2 and SW-3 is undisturbed or reclaimed. Impoundment SW-3 would be removed as part of the Project and would not be replaced during reclamation.
37	EPA				Appendix 3-B Table 4	In Appendix 3-B, Table 4, Energy Fuels Crooks Creek Water Quality Summary, on page 3B-4 we recommend adding the water quality standards for Crooks Creek or highlighting potential exceedances of the standards. Similarly, we recommend adding water groundwater quality standards to Table 6 - Groundwater Quality Mean Values.	A new table, Table 4, is added to Appendix 3-B, and this table lists WDEQ-WQD and EPA water quality criteria. The other tables in the appendix are renumbered accordingly, and associated text references updated. In the surface water and groundwater quality tables (Tables 5 through 8), the reported concentrations in excess of the regulatory criteria listed in Table 4 are highlighted.
38	EPA		4-27		4.2.5.1.1	**Sediment.** Page 4-27, Section 4.2.5.1.1, Surface Water Quality discusses mitigation measures for minimizing sediment transport impacts. Although the draft EIS discloses several important commitments related to minimizing sediment transport, it does not provide the information needed to assess the probable hydrologic consequences of the mining and reclamation plans as required by [mining-impacted] Hydrology Guidance 8 (WDEQ/LQD). We recommend a sediment yield evaluation plan be included in the FEIS (or technical reports) as required by Guidance 8, Appendix 2, to establish a pre-mining baseline to evaluate whether attainment of interim reclamation standards is met. We also note in the first bullet on page 4-27, that the Spill Prevention Control and Countermeasure Plan (SPCC) is not associated with sediment transport. Under the Oil Pollution Act, the SPCC is a facility's plan to prevent and contain oil spills. It is likely that this bullet intended to refer to the Storm Water Pollution Prevention Plans that would be required through the storm water WPDES permits.	The information needed to determine the Probable Hydrologic Consequences is included in the WDEQ/LQD Permit to Mine 381C, as approved by WDEQ-LQD in July 2015, and is referenced in the FEIS. More specific cross-references to the WDEQ-LQD permit have been added to Section 2.3.4.2 of the FEIS. The use of the term "interim" in the FEIS is clarified. In some places, the term refers to practices used to reduce impacts on temporary features, such as "interim" seeding of topsoil stockpiles to help reduce erosion. In others, the term refers to "Interim Reclamation" or Interim Mine Stabilization (Section 2.3.5.10), which applies to a specific set of circumstances in which the WDEQ/LQD and the BLM approve temporary closure of a mine, usually for economic reasons (43 CFR 3809.401(5) and LQD Noncoal Rules and Regulations, Chapter 3, §k(ii). In Section, 4.2.5.1.1, the first bullet in the Sediment Transport discussion of Surface Water Quality is corrected.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
39	EPA		2-18		2.3.4.2	**Design Storms.** On page 2-18, Section 2.3.4.2, the draft EIS mentions sediment ponds will be sized to contain the 100-year, 24-hour storm plus the estimated sediment storage volume for one year. As noted in the EIS the more conservative design was selected because of the potential for radium to be present in storm water. We are pleased to see a more conservative design storm than the 10-year, 24-hour storm required by the WDEQ regulations for sediment ponds. We recommend the final EIS discuss whether the more conservative design be required through BLM's approval of the Plan of Operations. We also recommend that this discussion address the factors used to arrive at the 100-year design storm basis. The DEIS states that the 25-year, 24-hour storm was selected as the design storm for sizing of diversions, culverts, and stilling basins. We recommend consideration of a 50- or even 100-year storm event return period based upon a more conservative approach to the expected life of the diversion and the anticipated increased frequency of severe precipitation events during this era of climate change effects. The overall project life is anticipated to be 20 years from initial construction to final reclamation as stated on Page 2-32. We note the WDEQ Guidance 8 for Mining-impacted Hydrology recommends a 50-year, 24-hour design storm basis for temporary diversion channel and culverts.	Appendix D-6, Section 7 of the Mine Plan in the WDEQ-LQD Permit to Mine 381C as approved by WDEQ-LQD in July 2015, discuss the factors used to arrive at the design storm basis. These designs have been accepted by the WDEQ-LQD. Cross-references to these sections of the LQD Permit are added to Section 2.3.4.2 of the FEIS. The more conservative storm recurrence period (100–year versus 10–year) selected for the sediment pond designs, in conjunction with the 24-hour storm duration, was used to help ensure there would be no releases from the ponds because of water quality concerns, as well as ensuring adequate sediment capacity (Section 2.3.4.2 of the FEIS). However, structures such as diversions, culverts, and stilling basins are not intended for water or sediment retention, so the more conservative storm recurrence period was not considered necessary. In addition, the anticipated life of structures such as diversions is generally less than the life of the Project (i.e., less than 20 years). These features are used primarily during mining of the Congo Pit, which is projected to last 8 years, and may be removed during reclamation. In contrast, sediment ponds generally remain in place until reclamation is deemed successful. WDEQ-LQD Guideline 8 recommends different storm recurrence periods depending on the life of the diversion (e.g., a 25–year recurrence period for diversions in place for 3 to 10 years). It is recognized that the use of design storm events may not cover all the storm events encountered during the life of a project, particularly given the variability of precipitation and snow melt in high desert environments. The WDEQ-LQD statutes and regulations provide for measures to address the possibility of unexpected events, including: inspections to ensure the surface water control features were properly constructed and are functioning (e.g., Sections VI and VII of WDEQ-LQD Guideline 15); annual reports with evaluation of the extent to which "expectations and predictions" have been met (W.S. §35-11-411); and designation of operator duties, including protection of soil and water (W.S. §35-11-415).
39 Continued							With respect to climate change and associated precipitation variability, no practical methods exist to evaluate the effect of climate change in a particular place from a single project, especially considering the natural variability in precipitation at the site (Section 3.2.1.1 of the FEIS) and the relatively short duration and small area of the project (see e.g., Intermountain West Climate Summary, 2007).
40	EPA					**Ore Spills.** We recommend the final EIS list required design or mitigation measures to prevent and clean up spills from the ore conveyor. We have found in our reclamation and cleanup activities at other mine sites that storm water drainage or acid generation from spilled ore can be a major contributor to poor water quality. It appears that much of the conveyor system would be outside of the area controlled through the water quality permits and storm water controls for the mine. This issue may be addressed through expanding the area for storm water controls or best management practices to prevent runoff from ore spills.	The ore conveyor would only be constructed if the alternative for an On-Site Ore Processing Facility is chosen. If constructed, the conveyor would be covered to eliminate spills and control fugitive dust (Section 3.5.1 of the Mine Plan in the WDEQ-LQD Permit to Mine 381C). In addition, the length of the conveyor would be included in the Mine Permit Area and the NRC License Area; therefore, all requirements for inspections, spill control, dust control, mitigation, and remediation would be applicable. The text in Section 2.3.4.5.1 is updated to reflect the requirements of the Mine Plan.

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41	EPA		4-32		Figure 4.2-2	**Ground Water Drawdown Model.** We recommend including additional information about the groundwater drawdown model presented in Figure 4.2-2, on page 4-32 of the draft EIS, and the factors used in the model. More specifically the following types of information would clarify the model assumptions, and address concerns with post-mining aquifer recovery: Identify the specific hydrologic model, and the assumptions and inputs used to determine the drawdown contours on Figure 4.2-2 such as aquifer characteristics, boundary conditions and precipitation scenarios. The discussion summarizes the historical quantities dewatered and the subsequent recovery of the aquifer to within 90% of pre-mining water levels. However, it is unclear if predictions have been made to project water table elevation and recovery time after the proposed mine is reclaimed. We recommend that the final EIS include the estimated time of recovery and elevation of the Sheep Mountain groundwater table.	Section 4.8.2.2 of the Reclamation Plan and Exhibit D-6-15 in Appendix D-6 of the WDEQ-LQD Permit to Mine 381C, as approved by the WDEQ-LQD in July 2015, describe, in the requested detail, the methods used to evaluate the drawdown due to groundwater withdrawal from the Congo Pit and the Sheep Underground Mine. Section 4.8.2.3 of the WDEQ-LQD Permit to Mine 381C, as approved by the WDEQ-LQD in July 2015, includes similar information on the groundwater recovery after cessation of pumping from the Congo Pit and the Sheep Underground Mine during reclamation of these facilities. Figure 4.2-2 is replaced with Map 4.2-1 which is the most recent drawdown map from WDEQ-LQD Permit to Mine 381C. The text in Section 4.2.5.4 is also updated.
42	EPA		2-41			**Septic Tank and Leach Field for Processing Plant.** Domestic liquid wastes would be disposed through a permitted septic leach system at the processing facility (Page 2-41). The final EIS should discuss what wastes are included under the term domestic liquid wastes and estimate volumes. In particular, laundry wastewater can be of concern from facilities handling hazardous materials.	The discussion of domestic liquid waste in Section 2.3.10.2 is clarified in the FEIS.
43	EPA		2-43 & 2-44			**Drinking Water Source for the Mine and Mill.** Pages 2-43 & 2-44 - Given the historic impacts in the project area, it will be important to assure that mine workers have a safe supply of drinking water. We recommend the final EIS identify the location(s) of the well and target aquifer for the potable water treatment system during operations.	Based on the anticipated workforce (Section 2.3.7) and anticipated potable water usage rates (Section 2.3.11.3), potable water could be trucked from Jeffrey City throughout the life of the Project. Energy Fuels could decide, in the future, to drill a well for potable supply, which could require treatment. However, installation of a water supply well is considered speculative at this time. No change has been made to the text.
44	EPA				Table 1.3-1	**Radionuclide NESHAPS.** Under 40 CFR Part 61 Subpart W (National Emission Standards for Radon Emissions from Operating Mill Tailings), the EPA regulates radon emissions from uranium recovery facilities. This source is subject to Subpart W and is required to receive a Construction Approval from EPA, prior to construction of the source. EPA recommends that Table 1.3-1 include that Subparts A (General Provisions that any NESHAP facility must meet), B (National Emission Standards for Radon Emissions from Underground Uranium Mines) and W; and explain that regulated sources require construction approvals be granted by EPA prior to construction. Additionally, EPA has proposed changes to the Subpart W rules, which we will take into consideration as appropriate in processing the Construction Approval. We also offer assistance to BLM regarding questions about the NESHAP regulations. The requirements of NESHAPS Subpart W listed in Table 1.3-1 are not correct regarding "... for existing uranium mill tailings.." as the regulated sources at this facility will be considered "new", and EPA recommends revising the Table accordingly.	Additions and deletions are made to Table 1.3-1. The BLM is aware that EPA is revising the Subpart W requirements and Table 1.3-1 reflects how Subpart W applies to the heap leach facility. 40CFR61 Subpart W does not apply to the Sheep Mountain Mine, as there is no processing taking place. Processing will be conducted at the proposed heap leach facility.

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45	EPA					**Compliance with NESHAPS.** The EPA recommends that the dose estimate to the public from the underground mines, Sheep 1 and Sheep 2, be determined using the COMPLY-R computer program or equivalent computer model that has received prior approval from EPA, to show compliance with Subpart B of the radionuclide NESHAPS. We recommend that the final EIS disclose the results of COMPLY-R.	The BLM recognizes that the EPA requires COMPLY-R to show compliance with Subpart B for a construction permit of the underground mine shafts. The BLM believes that COMPLY-R is a black box model which is not well suited to a site such as Sheep Mountain. Further, it is archaic in its formulation and will not run on versions of Windows newer than XP. Nevertheless, it was run on an older machine with the result that the nearest receptor, Claytor Ranch, received a dose of 2.55 mrem from the combination of the Sheep 1 and Sheep 2 adits. This result is added to the FEIS in Section 4.4.7.1.1. However, these results are presented for the purposes of disclosing impacts only.
46	EPA		2-42		2.3.10.3	**Disposal of Radioactive Byproduct Material.** Page 2-42, last paragraph of Section 2.3.10.3 mentions that, "During Construction and Operation, all solid 11e2 byproduct material, other than processed ore in the Heap Leach Pad, would be temporarily held in an interim solid waste management area identified within the Processing Facility." This interim solid waste management area may be subject to the requirements of 40 CFR Part 61 Subpart W, as determine by the EPA. It is recommended that this information be disclosed in the Final EIS.	The following language has been added to Section 2.3.10.3 in Chapter 2: "The interim solid waste management area (within the heap leach area) may be subject to the requirements of 40 CFR Part 61 Subpart W, as determined by the EPA."
47	EPA				3.5 4.1.5 4.3.5 4.4.5	**Disclosure of Radiation Impacts.** We recommend that the final EIS include additional information to improve the disclosure of potential risks from radiation. As the draft EIS is currently written, it is unclear how radiation exposures will change as a result of the proposed mine expansions and on-site mill and the relative magnitude of radiation levels for employees, visitor, local residents, and those that use neighboring land. We recommend that the analysis in Chapter 4 present a summary table of the pre-operational radionuclide monitoring data, as compared to predicted radiation levels expected during construction, operations, reclamation and post reclamation, for at least four classes of receptors: employees, visitors to the facility, recreation/hunting uses, and nearby residents. Also, a table of regulatory dose limits should be included, for comparison to the estimated dose received. It is recommended that BLM model the dose to the public and workers that would be observed during the most conservative operational year (e.g., surface mining, underground mining and processing are all in operation) over a range of anticipated emission rates, and provide a summary of the model results. For an example of a well written summary of radiation impacts, we recommend the Final Uranium Leasing Program Programmatic Environmental Impact Statement (ULP-EIS), dated March 2014 at: http://ulpeis.anl.gov/documents/fpeis/index.cfm. For more specifics, please see Volume 1 of the EIS: Section 3.5 (Specifically Table 3.5-1) on (page 3-84 in the EIS pdf), Section 4.1.5 Human Health for Alternative 1 (very similar to Sheep Mountain no action alternative), Sections 4.3.5 & Section 4.4.5 Evaluates the human health impacts for Alternative 3 & 4 of the ULP-EIS for four scenarios: (1.) worker exposures - uranium miners; (2.) worker exposure - reclamation workers; (3.) general public exposure- residential scenario; and (4.) general public exposure - recreationist scenario. Appendix D.5. Starting on page 224/578 in Volume 2 of the ULP-EIS.	Pre-operational monitoring data are listed and summarized in Appendix 3-A. A paragraph was added to Section 4.4.7.1.1 which estimates a dose to a member of the public located at the "average" air monitoring location and comparing those doses to the MILDOS output. As suggested, Table 4.4-11 addresses the results predicted by MILDOS for four classes of receptors, albeit using slightly different scenarios. All the MILDOS results are for the maximum annual result. The paragraphs above Table 4.4-10 lists the pertinent standards; no table is necessary to do so. However, the BLM believes that the EPA's suggested modelling has been completed to the extent necessary to disclose impacts within the FEIS . "The purpose of analyzing camping near the mine during operations was for a conservative estimate of impacts considering operations would cause the highest rate of exposure from radium 226. As noted in Section 4.4.7.1.1, post closure radium 226 levels in the reclaimed Congo Pit would be lower than current levels. The Heap Leach pad would be permanently removed from public domain upon final closure and land transfer to the DOE. As noted in Section 3.5.1, hunters have been known to use the Project Area even though access is currently blocked by locked gates; however, there is no indication that hunters camp within the project area or will camp within the project area after reclamation especially considering the final reclamation of the project area will leave no access roads. For these reasons, the suggested analysis would not be practical or realistic especially considering the most conservative and realistic scenario has already been analyzed by considering camping near the mine during operations. The following footnote is added to Table 4.4-11 to clarify the conservativeness of the BLM's analysis: "Campers are not anticipated to be present due to limited access during Operations and lack of roads after Reclamation. However, hunters, who might camp, have been known to use the area, so for a conservative assessment, exposure during Operations was assessed. Exposure would be less after Reclamation."

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48	EPA				Appendix 3-A	**Background Radiation.** When summarizing the background radiation information mentioned in the comment above, we recommend that additional information be added to the Tables presented in Appendix 3-A. First, we recommend that the data be summarized with an average and range of values over the sampling period. We also recommend adding guidelines, standards and criteria as applicable, so that the reader can understand the magnitude of the background radiation monitoring. The data descriptions/terms should also be defined and explained as needed. For example, in the Air Particulates Monitoring tables on pages 3A-9 through 3A-28, it is not clear how the reporting limit was determined and how the magnitude of the results indicates a low radio particulate concentration in air across the site. Please also explain how the data were handled/processed where "precision" is greater than "reporting limit".	Additional rows are added at the end of Table 1 in Appendix 3-A for radon range and averages. An extension of Table 2 in Appendix 3-A is added for gamma data. Table 15 in Appendix 3-A is added to summarize radioparticulate concentration results. The reporting limit in uCi/ml is a requirement of NRC Regulatory Guide 4.14. The precision is a function of the counting statistics of the radiological sample. There is no operational impact with which to compare until mining and milling are occurring.
49	EPA		3-38 & 3-39		3.2.4.3	Section 3.2.4.3 (pages 3-38 & 3-39) includes some exposure rates in uR/hr. The EPA recommends that these values be related to doses received. We also recommend that the significance of the values be addressed, considering the high standard deviation values of 42.3 uR/hr and 128 uR/hr referenced (this data needs to be made relatable in some way).	These values are typical of a highly mineralized area. No dose, per se, can be calculated without having a receptor. Assuming that an individual was present at the site for 8760 hours per year and by assuming that 1 uR/hr is equivalent to 1 urad/hr, the dose rate to an inhabitant may be estimated. If a person were at the location at which the exposure rate were 40 uR/hr, for example, the potential dose would be 8760 hrs times that rate, or approximately 350 mrem/yr. However, without knowing the length of time that a potential inhabitant is being exposed, it is not possible to estimate an actual dose. No change to the document.
50	EPA					The EPA recommends that the final EIS discuss how the monitored values or background conditions relate to the MILDOS results for dose from particulate radionuclides to the receptors modeled.	Language is added to Section 4.4.7.1.1 to compare doses from inhaled radium-226 at air monitoring sites to the doses calculated by MILDOS.
51	EPA					The EPA recommends that the final EIS provide further explanation as to why radionuclide particulates from the Congo Pit were not included in the estimated radiological dose to the public or workers.	A paragraph has been added to Section 4.4.7.1.1 as follows: No detailed analysis of radio-particulate emissions from the Congo Pit was performed using modelling. Experience with open pit mines in Washington and California has shown there is no appreciable release of radio-particulates from the pit that would be accessible to members of the public (Little, 2015). The Congo Pit is several hundred feet deep. That coupled with the assumption that water spray is going to be used during mining operations, led to the assumption that no particulates would be released from the pit that would impact the public. Additionally, the BLM must assume for this analysis that the requirements of the WDEQ-AQD air permit are met and particulate matter emissions are acceptable or are acceptable with conditions of approval from the Congo Pit as a result of this permit (through dust control and other measures). If particulate emissions are acceptable, then impacts as a result of radio-particulates would also be acceptable because there is no separate standard for radio-particulate emissions.
52	EPA				Appendix 2-B	The EPA recommends that the final EIS provide information on the operational radiological monitoring plan and include how the data collected will be used to ensure protection of workers, public health, livestock and game. It is unclear from Tables 1 and 2 in Appendix 2-B what monitoring is planned during operation and whether Table 1 is for pre-operational monitoring only. The EPA recommends that the final EIS include a more detailed information plan, including what media will be monitored, what standards/limits the results will be compared to, and what actions will be required if standards/limits are exceeded.	As stated in Section 2.3.12.3, most of the monitoring presented in Table 1 of Appendix 2-B is for the life of the Project and is not only preoperational. Additional or detailed radiological monitoring will likely be required by the NRC as part of the NRC licensing process for the on site processing plant., but the BLM does not have the information available to know what this monitoring might consist of.

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53	EPA		4-93		Table 4.4-10	It is unclear from Table 4.4-10 - Modeled TEDE Doses from Mining and Ore Processing (4-93), if the modeled TEDE doses includes dose from radon. Please clarify in the final EIS. Also for Table 4.4-10 please clarify: If the doses modeled were done at the maximum predicted mining/processing conditions. How the "Mill" TEDE" values were determined. There is a math error for the total for "Maximum NRC - processing max (NRC3/NLA-N1)". It should be 102.3 mrem/yr, instead of 26.4, as indicated.	Yes, doses for Mine and Mill both include dose from radon decay products. Doses reported represent the maximum for all years of production. The TEDE values for the mill were calculated using the MILDOS model and include both external and internal doses from all applicable sources . See Appendix 3-A. The math error has been corrected.
54	EPA					Please clarify whether the Claytor Ranch is the nearest resident. We recommend more clearly identifying the nearest resident and whether there was any passive gamma or radioparticulate monitoring conducted at the nearest resident location as well as whether any future monitoring is planned there.	As stated in Section 4.4.7.1.1 and the text accompanying Table 4.4-10, the Claytor Ranch is the location of the nearest resident. Radon monitoring was conducted at the Claytor Ranch. Those results are summarized in Table 1 in Appendix 3-A. The NRC may have requirements for monitoring at the nearest resident as part of the licensing for the on-site processing facility but the BLM does not have the information to know the details of this monitoring effort.
55	EPA					The EPA recommends discussing the anticipated level of radiological impact to livestock and wild game during the operation and post-reclamation phases of the project.	Information regarding radiological impact to livestock and wild game has been added to Chapter 4 in the FEIS.
56	EPA					Radiological Impacts Analysis Technical Document (RIATD). EPA recommends that Appendix B of the Air Quality Technical Support Document (Appendix 4-A of draft EIS) be revised to more clearly model anticipated radiologic impacts and better explain model inputs as follows: a. The emissions inventory indicates that particulate emissions are high from the Congo Pit. Considering this information, the EPA recommends that the final EIS consider radio particulate emissions in the dose estimations. b. The final EIS should disclose if there are any plans to compare modeled particulate dose to those determined through monitoring data? c. The EPA recommends that the important parameters (Table 3, RIATD) be put into the model over a range of anticipated values so that the anticipated range of doses can be predicted. d. Please provide additional information on why the spoils pile concentration of 40 pCi/g of uranium decay chain concentrations is considered conservative. There is a wide range of Ra-226 concentrations in waste rock material. e. Clarify that the modeled doses in Table 4 of the RIATD are from mine activity. Page 15 states that the doses are considered conservative estimates. This is not true considering that the processing facility dose contribution was not taken into account. f. Page 16 of the RIATD: the EPA recommends that the Rn-222 dose from the mine adits should also be presented as results from a model created using COMPLY-R, the program required to show compliance with the 40 CFR 61.22 standards of 10 mrem/yr. g. Page 3 of the RIATD states that, "The purpose of this report is to describe potential doses to members of the public from mining-related activities including the Congo Pit, stockpiling of ore, storage of spoils materials and releases from the underground mine adits." Page 17 provides information on potential doses from the processing facility. Please expand upon how the dose contribution from the processing facility was determined, including what assumptions were made and what inputs were used to arrive at the dose contribution This document should address the potential dose to the public from the connected action of the on-site processing facility and background dose. The total dose would serve as the cumulative impact for radiation dose.	a. See response to comment #51. b: BLM has no plans to compare modeled particulate dose to monitoring; however, the NRC may require such. c. MILDOS is not designed to do stochastic modeling. To do as suggested would require multiple runs of the model with little value. Further, the variation in occupancy at a given location would likely swamp the variation in the calculated dose. d. The average ore grade of 0.122% U represents an average radium-226 concentration of 342 pCi/g. As stated in the comment, there is, indeed, a large range of radium concentrations in waste rock, from background to no higher than ore grade. A 2014 study by Energy Fuels of their Whirlwind Mine found a radium-226 concentration of only 4.2 pCi/g in waste rock having a U-nat content of 0.128% Unat. Given that data, it seems that 40 pCi radium-226/g rock is reasonable. e. The doses presented in Table 4 of the RIATD are for the mining project (locations A-Z). The doses presented in Table 5 are from the milling facility (locations NRC1 - NRC16). f. See Response to Comment #45 g. Dose contribution from the processing facility was calculated using the MILDOS model.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
57	EPA					Air Quality Impacts and Modeling. The air quality modeling conducted for the draft EIS may not capture maximum impacts, as noted in earlier comments during the modeling process. The modeled predicted impacts were not projected to exceed the levels of the National Ambient Air Quality Standards (NAAQS); however, the analysis shows the particulate matter (24-hour PM2.5) and nitrogen oxide (1-hour NO2) impacts are approaching the NAAQS for all modeled scenarios (89% to 93% for the 24-hour PM2.5). The air quality analysis also shows that impacts from operations were projected to be greater than the 24-hour PM10 and 24-hour PM2.5 Class II increments. As the model used may under predict air impacts and air quality impacts are approaching standards, we recommend that additional air mitigation measures be developed in the final EIS to reduce PM and NO2 impacts. The main modeling issues that make it difficult to determine whether air modeling predictions are accurate are: (1) it is not clear whether the methodology used to analyze the near field air quality modeling results for this project used the averaging approach consistent with EPA guidance for the NAAQS comparisons; and (2) it is also not clear whether the data used to support the in-stack ratio assumptions for the near-field modeling were representative because this information is not present in the modeling documents. It appears that the ozone impacts refer back to an older version of the air modeling from the Continental Divide-Creston (CD-C) EIS. A number of important changes were made to improve the CD-C air modeling since the version referenced in the Sheep Mountain draft EIS. We recommend that the final Sheep Mountain EIS be updated to incorporate the air modeling results from the final CD-C EIS.	The air quality analysis performed for the Project is adequate for demonstrating compliance with ambient air quality standards under NEPA. All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern, and do not represent a regulatory PSD Increment Consumption Analysis. The determination of PSD increment consumption is the responsibility of the WDEQ and the analysis will be conducted as part of the New Source Review permitting process. Modeling results presented for 1-hour NO2 concentrations for comparison to the NAAQS and WAAQS are 2-year averages of 98th percentile maximum 1-hour concentrations. For informational purposes, the maximum yearly values will be included in the revised AQTSD. In addition, references for in-stack NO/NO2 concentration ratios have been included in the revised AQTSD available for the FEIS (see Section 3.4). The FEIS and revised AQTSD include references to the CD-C FEIS project for regional ozone impacts and for cumulative AQ and AQRV impacts.
57	EPA					To assure that emissions from the project do not approach or exceed the PM2.5, or NO2 NAAQS, or significantly change air quality, BLM may want to consider additional mitigation for the project in the final EIS.	Thank you for your comment.
58	EPA					The top five project-related sources of PM2.5 are all related to fugitive dust from the mine and roads including: (1) surface mobile sources, mine-wide unpaved road travel [vehicles on dirt roads]; (2) overburden removal; (3) wind erosion of stockpiles; (4) dozing; and (5) wind erosion of open acres. Dust controls would likely offer the most mitigation benefit toward reducing particulate emissions. We also recommend consideration of PM monitoring during construction and operation of the mine with adaptive management to reduce PM impacts for instances when monitored values are approaching or exceeding the NAAQS. It may also be useful to engage WDEQ on the subject of potential WDEQ requirements for PM monitoring or controls so that those considerations can be taken into account by the NEPA process.	The modeling performed for the DEIS is adequate for demonstrating compliance with ambient air quality standards under NEPA. Through the New Source Review permitting process, the WDEQ identified additional mitigation measures and monitoring requirements that could be required as part of permitting conditions (see Section 2.3.12.3, Environmental Monitoring during Operations - Air, in Chapter 2. This includes visual opacity restrictions and the Method 9 observation monitoring. These measures do not include measures for managing fugitive dust from County Roads although County Road Use and Maintenance agreements are required to be obtained by Energy Fuels which will likely require dust suppression components. Air quality monitoring and compliance programs are summarized in Section 2.3.12.3 and 2.3.12.4 and in Tables 1 and 2 in Appendix 2-B. The BLM is not required to develop mitigation measures that would exceed those required by other agencies who manage air resources.
59	EPA					Up to 96% of the project's predicted NOx emissions are expected to come from engine emissions associated with surface mobile/nonroad sources and underground mine mobile sources. Requiring lower emitting engine technology would reduce PM2.5 and NOx emissions as well as having the added benefit of reducing other pollutants such as carbon monoxide and hazardous air pollutants. Diesel particulate filters may also reduce PM2.5 emissions and impacts from diesel equipment.	Thank you for your comment. Please see above comment response.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
60	EPA				Table 4.2-4	**Greenhouse Gas (GHG) and Climate Change.** We appreciate the inclusion of quantitative estimates for GHG emissions for construction and operation of the proposed project and alternatives. We note that the draft EIS estimates both on-site and off-site production alternatives as having exactly the same amount of GHG emissions as shown in Table 4.2-4 of the draft EIS. However, based on the emission inventory of combustion pollutants, summarized in Tables 4.2-2 and 4.2-3, it appears that the alternative considering off-site processing would have more GHG emissions due to surface mobile sources associated with ore haulage to the Sweetwater Mill. We recommend that BLM re-evaluate these calculations and make any necessary revisions to the GHG estimates.	Thank you for your comment. The calculation of total GHG emissions from off-site processing is revised in the FEIS.
61	EPA		4-10			In future environmental reviews, we recommend that Greenhouse Gases discussions such as on page 4-10 of the draft EIS be updated to be consistent with the CEQ Revised Draft Guidance for Greenhouse Gas Emissions and Climate Change Impacts at: http://www.whitehouse.gov/administration/eop/ceq/initiatives/nepa/ghg-guidance. Although we recognize that climate impacts are not attributable to any single action, but are exacerbated by a series of smaller decisions. As such, it is not useful to compare GHG emissions from a proposed action to national or global emissions. As noted in the CEQ revised draft guidance, such an approach does not reveal anything beyond the nature of the climate change challenge itself: the fact that diverse individual sources of emissions each make relatively small additions to global atmospheric GHG concentrations that collectively have a huge impacts. With regard to draft EIS statements referencing the infeasibility of assessing the degree of impacts a single project may have on global climate change or the "controversy" around whether changes to natural systems can be quantified, as noted by CEQ, estimated GHG emissions may be used as a reasonable proxy for assessing potential climate change impacts.	The Greenhouse Gases and Climate Change sections have been revised in the FEIS. Please see Sections 3.2.1.5 and 4.2.1.1.
62	NRC	2	2-10			"Access to the site would be controlled by barbed wire fencing and/or gating at all defined points of ingress and egress to the Project Area and internally at the “NRC License Area” … We consider that NRC Restricted Area was probably meant here.	The language has been revised to include the following: "Access to the site would be controlled by barbed wire fencing and/or gating at all defined points of ingress and egress to the Project Area and internally at the “NRC Restricted Area” – an area that contains the uranium processing facility that would be external to the Permit to Mine 381C mine permit boundary but within the Project Area, once NRC licensing is complete."
63	NRC	2	2-14			"The pond would be sized as required by NRC to contain …" NRC has no specific requirement for pond sizing as stated. Therefore, we recommend removing "as required by NRC" from the sentence.	"as required by NRC" has been removed from the sentence.
64	NRC	2	2-14 to 2-15			"The pond would be sized as required by NRC to hold…" NRC has no specific requirement for pond sizing as stated. Therefore, we recommend removing "as required by NRC" from the sentence.	"as required by NRC" has been removed from the sentence.
65	NRC	2	2-15			"and would be sized as required by NRC to hold…" NRC has no specific requirement for pond sizing as stated. Therefore, we recommend removing "as required by NRC" from the sentence.	"as required by NRC" has been removed from the sentence.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
66	NRC	2	2-31			"The NRC would have a similar requirement for interim management of the Ore Processing Facility." We are unaware of such a requirement, and therefore recommend removing this sentence.	The sentence has been removed. The following sentence has been added: "Energy Fuels would similarly manage the facility during periods of temporary closure."
67	NRC	2	2-44			The On-Site Processing Facility, which would be regulated by the NRC, would be required to incorporate surface water management practices which account for the PMP and PMF events. We recommend stating "which account for significant rain events." rather than referring to PMP and PMF events..	Revision has been made as suggested.
68	NRC	2	2-57			with NRC requirements to minimize spoils and leaks. For example, the Heap Leach Pad would be lined with a synthetic triple liner system with dual leak detection." We consider that "to minimize spills and leaks" was intended.	Revision has been made as suggested.
69	NRC	2	2-75			"Energy Fuels is required by the NRC to design the Heap Leach Pad to withstand a major storm event (PMP)." We recommend this sentence be replaced with the following text: "NRC requires that a surface impoundment be designed, constructed, and maintained to prevent overtopping resulting from normal or abnormal operations, overfilling, wind or wave actions, rainfall, run-on, from malfunctions, and from human error. In guidance space, NRC has interpreted this to mean applicants design to consider storm events like a 100-year storm during operations. For the closure period, applicants need to consider significant storm events, like a probable maximum precipitation event, when designing the final cover system.	Revision has been made as suggested.
70	NRC	4	4-25			"Both NRC and DOE review the reclamation plans and as-built topography for stability, including standards for diversion of the 1,000-year storm (NRC, 2008)." We recommend this sentence be replaced with the following text: "Both the NRC and DOE review the reclamation plans and as-built topography for stability, including the ability to resist storm water flows resulting from a PMP event. "	Revision has been made as suggested.
71	NRC		7-12			"Nuclear Regulatory Commission. 2008." No document title is provided for this reference.	The language in this section was revised based on NRC Comment 70, above. The reference was changed to "NRC, 2015" to refer to NRC's comment letter on the DEIS.

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72	Wild Earth Guardians	3	3-39			Most of the project area drains into Crooks Creek, a tributary to the Sweetwater River. DEIS at 3-39. Crooks Creek is designated a Class 3 fishery by WGFD. DEIS at 3-82. This stream has perennial flows near the project site and becomes intermittent downstream where flows disappear into sand alluvial deposits. DEIS at 3-42. Presumably, these flows connect with the Sweetwater River through hyporheic flow. Radiation levels in this stream periodically exceed Class III groundwater standards (suitable for livestock) due to radiation. DEIS at 3-43. This presumably results from past uranium mining activity in the area, which is correlated with unnaturally high levels of radiation, far above background levels for the Battle Springs formation. *See* DEIS at Map 3.2-9. Crooks Creek is also listed as a Category 5 impaired water under the Clean Water Act for oil and grease contamination. DEIS at 3-44. In some cases, groundwater in the project area has been shown to discharge into Crooks Creek, including from the Battle Mountain formation into the wetlands near where Crooks Creek submerges into alluvium. DEIS at 3-46.	The exchange of surface water and groundwater was considered in the development of the EIS, and the potential impacts of the Project on surface and groundwater were considered minimal based on the site conditions and response of the system to previous mining. The proposed Project is similar to previous mining, including cycles of dewatering and recharge, with the exception of more extensive reclamation requirements. Also, to help ensure this evaluation is confirmed, continued surface and groundwater monitoring are part of the Project. The text in Sections 3.2.5.1 and 3.2.5.2 is updated to provide additional information on the surface water and groundwater conditions, and the text in Section 4.2.5.4.1 is updated to provide additional information on treated water discharges to Crooks Creek. The hydrogeologic information for the site indicates the presumption that the flow from Crooks Creek connects with the Sweetwater River through hyporheic flow is not appropriate. Hyporheic flow is generally considered to occur over a relatively small scale and time frame along a stream bed (see, e.g., Boano, F., J. W. Harvey, A. Marion, A. I. Packman, R. Revelli, L. Ridolfi, and A. Wörman (2014), Hyporheic flow and transport processes: Mechanisms, models, and biogeochemical implications, Rev. Geophys., 52, 603–679, doi:10.1002/2012RG000417). As discussed in two of the EIS references (Stephens (1964) and Love (1970)), Crooks Creek disappears before reaching the Sweetwater River, i.e., there is no Crooks Creek stream channel along which hyporheic flow could occur. Although there is exchange between the groundwater of the Arikaree Aquifer, into which Crooks Creek disappears, and the Sweetwater River (Borchert, 1977 and 1987), the identification of any direct contribution from Crooks Creek to the Sweetwater River through hyporheic flow along the Sweetwater River channel would be tenuous, at best.
72 Continued							The presumption that the elevated concentrations of uranium and radionuclides in Crooks Creek are associated with past uranium mining activity and are above background levels in the Battle Spring Formation (or the Arikaree Aquifer) is also not appropriate. The impact of naturally occurring uranium mineralization on surface and groundwater quality has been documented in many areas. With respect to the area of Crooks Gap, Denson et al. (1955), Stephens (1964) and Love (1970) all noted historic, elevated uranium concentrations in surface and groundwater samples collected in the area. Similarly, Mason and Miller (2005) and BLM (2012) report elevated radionuclide concentrations in the Battle Springs Formation in the Great Divide Basin in mineralized areas.
73	Wild Earth Guardians					BLM must analyze the presence of and impacts to federal reserved water rights and withdrawn lands under Public Water Reserve No. 107. The project cannot adversely affect those lands and waters.	The potential for impacts to Public Water Reserves were considered but not analyzed in detail because there are no Public Water Reserves in or near the Project Area that could be directly or indirectly impacted by any of the alternatives. Table 3.1-1 has been updated accordingly.

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74	Wild Earth Guardians	3	3-44			Surface waters in the McIntosh Pit and Western Nuclear Pond already show poor water quality with high turbidity and elevated levels of radionuclides. DEIS at 3-44. These levels are significantly worse than the water quality in Crooks Creek. *Id*. We are concerned that these water could make their way to Crooks Creek and cause contamination and degradation of water quality. We are concerned that during dewatering of mine facilities (DEIS at 4-26), the potential for contamination is elevated. It is troubling that BLM plans to rely on subsequent NEPA to determine environmental impacts from this clearly connected project action, because the agency's choice of alternatives for the project as a whole will then influence the options for minimizing environmental impacts during dewatering. This is why NEPA requires unequivocally that the EIS analyze <u>all</u> cumulative impacts and connected actions at <u>this</u> stage.	As discussed in Section 2.5, the reclamation work on McIntosh Pit, including Energy Fuels previous reclamation responsibility for the part of the pit, and related improvements to Western Nuclear Pond have been consolidated under the WDEQ-AML Project 16-O. As a result, no direct impacts to either the McIntosh Pit or Western Nuclear Pond are anticipated due to Project activities. The text in Sections 2.5, 3.2.5.1, 4.2.5.4.1, and 5.3.1 is updated to provide additional information on McIntosh Pit and Western Nuclear Pond. With respect to McIntosh Pit, the elevated concentrations of uranium and radionuclides are due to the inflow of groundwater from the residual mineralized zones, i.e., not all the mineralized material was removed by prior mining of the pit. WDEQ-AML is in the process of reclaiming the pit, including backfilling the pit above the groundwater level. With respect to Western Nuclear Pond, it receives surface water runoff crossing mineralized areas, so the presence of uranium and radionuclides is not unexpected. The WDEQ-AML project also includes work on Western Nuclear Pond to improve its current function for recreation (fishing and hunting) and livestock/wildlife water source. The proposed Sheep Mountain Project would not impact McIntosh Pit or Western Nuclear Pond and would benefit from the WDEQ-AML work. The text in Section 2.3.1.1 has been updated to provide additional information on treated water discharges to Crooks Creek under the approved WYPDES discharge permit.
75	Wild Earth Guardians	4	4-25			BLM makes the explicit assumption that because surface flows from Crooks Creek do not reach the Sweetwater River, that indirect impacts to the river will not occur. DEIS at 4-25. This is a false assumption based on faulty analysis. Groundwater and surface streams are intimately interconnected from a hydrologic standpoint; groundwater in the upper layers upwells directly into stream and river channels or into floodplain springbrooks (Brunke and Gonser 1997). Benson (1953) found that water inputs to the Pigeon River, Michigan through groundwater upwelling actually controls populations of brook and brown trout by determining the location of spawning habitats. Boulton et al. (1991) recommended that analysis of hyporheic communities should be included in analyses of stream ecosystems.	As noted in the Response to Comment 72, the exchange of surface water and groundwater was considered in the development of the EIS, and the potential impacts of the Project on Crooks Creek and the Sweetwater River are disclosed. To help ensure this evaluation is confirmed, continued surface and groundwater monitoring are part of the Project. The text in Section 2.3.1.1 has been updated to provide additional information on treated water discharges to Crooks Creek under the approved WYPDES discharge permit.
76	Wild Earth Guardians					BLM has done no analysis of hyporheic flows that are likely to directly connect the waters of Crooks Creek with the waters of the Sweetwater River. In fact, BLM's analysis indicates that surface waters sink into sandy alluvial deposits. Where does BLM think these waters then go? If the agency had done water tracking studies with the use of chemical tracers, and found that no chemical tracers ended up in the Sweetwater River, this assumption would be supported by analysis. In the absence of such hard scientific data, and in light of the established scientific principal that groundwaters contribute significantly to river flows through hyporheic flow, the agency must assume that any contamination present in Crooks Creek will in fact reach the Sweetwater River. BLM has failed in its 'hard look' NEPA responsibilities in this regard. Gardner (1999, Attachment 1) provides a useful primer on the interconnected nature of surface water and groundwater that BLM should review as it revisits its analysis of potential impacts to the Sweetwater River.	As noted in the Response to Comment 72, the exchange of surface water and groundwater was considered in the development of the EIS, and the potential impacts of the Project on Crooks Creek and the Sweetwater River are disclosed. To help ensure this evaluation is confirmed, continued surface and groundwater monitoring are part of the Project. The text in Section 2.3.1.1 has been updated to provide additional information on treated water discharges to Crooks Creek under the approved WYPDES discharge permit.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
77	Wild Earth Guardians	4	4-25			BLM further relies on a complicated system of overflow pits and retention facilities to prevent surface water (and contaminants from mining activities) from reaching Crooks Creek. Radiation contamination has a very long active life. What is going to happen to contaminated soil/tailings/waste products once these catchment facilities are no longer maintained? We are concerned that as the intricate series of catchment basins and diversion structures (DEIS at 4-25) fall into disrepair, the contaminants on site will move into the local surface water system and contaminate Crooks Creek and the Sweetwater River. The DEIS does not appear to provide analysis on these long-term project impacts.	The presumption that the proposed system of surface water flow controls at the mine is complicated is not appropriate as the system is not unusual and is in line with the requirements of the WDEQ-LQD for surface water flow controls. The WDEQ-LQD Permit to Mine 381C, as approved by WDEQ-LQD in July 2015, includes requirements for reclamation of the surface disturbance resulting from the proposed Project, including handling of materials unsuitable for surface reclamation. See Section 4.2.5.1.1 for analysis of potential impacts related to on-site water management.
78	Wild Earth Guardians	3	3-21			Crooks Creek is underlain by the Frontier formation, a shale formation. DEIS at Figure 3.2-4. The Quaternary alluvial deposits of Crooks Creek also appear to be underlain by the Battle Springs formation, which is the ore-bearing formation, and the Fort Union formation, another shale. DEIS at Figure 3.2-4. For the project area itself, this is described in cross-section in Figure 3-19. The Battle Springs formation is the deposit that contains the uranium ore targeted for extraction (DEIS at 3-21) and is primarily porous arkosic sandstone (DEIS at 3-25). Existing mine spoils and other previously disturbed areas on the project site (TENORM) already contain elevated levels of radiation. DEIS at 3-38. We are concerned that groundwater flows in this formation could convey additional radioactivity from leaks or spills from heap leaching or other parts of the uranium extraction process, resulting in significant and long-term contamination of groundwaters beyond background levels of radiation.	As discussed in Section 2.3.3.7.1 of the FEIS, the base of the Heap Leach is designed to be impermeable, with a leak detection system to provide rapid detection of any leaks. Continued surface and groundwater monitoring would also be an integral part of the NRC monitoring requirements for the On-Site Ore Processing Facility. See Section 4.2.5.4 for a complete discussion on potential impacts to groundwater as a result of the Proposed Action.
79	Wild Earth Guardians	3	3-44			Groundwaters flow southward into the Great Divide Basin from the project area. DEIS at 3-44. We are concerned that degradation of groundwater quality due to increased radiation will lead, through southward groundwater flows, to contamination of surface springs and surface water bodies fed by the Battle Springs formation, including Battle Springs and the Chain Lakes (see DEIS at 3-45), which have been recognized as important wetland resources for wildlife. Potential direct and indirect impacts of the project on these surface water resources have not been analyzed in the DEIS, in violation of NEPA. We are concerned that surface or groundwater contamination resulting in the loss of function of wetlands in the Chain Lakes area or along Crooks Creek violate Executive Orders 11990 and 11988.	The groundwater discussion in Chapter 3, Section 3.2.5.2 is expanded and clarified. Even though the deeper groundwater at the Project might flow to the south and west into the Great Divide Basin, the groundwater flow rates in the vicinity of the Project are calculated to be less than 100 feet per year. The distances to Battle Spring and Chain Lakes from the Project are over 20 miles. In addition, there are numerous zones of naturally-occurring uranium mineralization in the Battle Spring Formation between the Project and these features, such as the zones being mined at the Lost Creek ISR Project. For these reasons, the Project is not expected to adversely impact surface or groundwater quality in the Great Divide Basin, and to help ensure this evaluation is confirmed, continued surface and groundwater monitoring are part of the Project. As a result, no loss of function of any wetlands are anticipated. See Section 4.2.5.4.1 for additional discussion on potential impacts to groundwater as a result of the Proposed Action.

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80	Wild Earth Guardians					The Bureau of Land Management convened a Greater Sage-Grouse National Technical Team to compile and evaluate the best available science on the potential impacts of BLM-permitted activities and recommend conservation measures that limit the impacts of these activities on sage grouse (NTT 2011, Attachment 2). This document recommended elevated levels of habitat protection within Priority Habitats, subsequently delineated by the U.S. Fish and Wildlife Service as 'Priority Areas for Conservation' (PACs) in 2013 by that agency's Conservation Objectives Team (COT 2013, Attachment 3). This includes lands in close proximity to the proposed uranium project. In addition, in October of 2014 the U.S. Fish and Wildlife Service ('Service') identified 'stronghold' areas recommended for an even more stringent level of protection. These stronghold areas likewise include lands in close proximity to the proposed Sheep Mountain project (*see* Attachment 4). The BLM is currently revising or amending all resource management plans across the range of the greater sage grouse to address the 'inadequacy of regulatory mechanisms' identified by the Service in its 2010 Final Rule designating the greater sage grouse as a Candidate Species under the Endangered Species Act (*see* Attachment 5). The BLM must consult with the Service to identify methods to avoid impacts to this Candidate Species.	No consultation with the Service is required for a candidate species. The Lander RMP is in conformance with the State's Core Area Strategy in protections for greater-sage grouse; this is the regulatory mechanism that the FWS has approved. Since the project area is not in Core Area (nor in the Services' "Highly Important Landscapes" which are the same as Core Area in this part of the Field Office), no additional protections are required. See RMP Decisions 4098 et seq.
81	Wild Earth Guardians					Noise must be limited to a maximum of 10 dBA above the ambient natural noise level after the recommendations of Patricelli et al. (2012); the ambient noise level in central Wyoming was found to be 22 dBA (Patricelli et al. 2012) and in western Wyoming it was found to be 15 dBA (Ambrose and Florian 2014, Attachment 7).	Impacts to greater sage-grouse from noise has been considered in Chapter 4 of the FEIS. The nearest sage grouse lek is over 2 miles away. The WDEQ-LQD and WGFD have not indicated that a measure for the protection of greater sage-grouse based on noise will be required through consultation and permitting efforts. Noise impacts as a result of off-site processing are considered in Chapter 4 and ESA-5, ESA-6, ESA-7, and ESA-8 have been proposed under the BLM Mitigation Alternative in response to this analysis.
82	Wild Earth Guardians	4	4-43			BLM notes that under the Proposed Action, project-related noise could exceed 10 dBA above ambient, resulting in significant impacts to sage grouse using nesting or brood-rearing habitats within 2 to 9 miles of the project area. DEIS at 4-43. In addition, noise from the loudest trucks along the Crooks Gap – Wamsutter Road would reach 34 dBA at the nearest lek sites. DEIS at 4-44. This is louder than the 10 dBA above ambient levels recommended as allowable under the best available science, and thus traffic along this road would have a significant impact not only on nest and brood-rearing habitats in proximity of leks, but also to breeding and loafing sage grouse in and around the active leks themselves. Three leks within 2 miles of this road are expected by BLM to experience adverse impacts (DEIS at 4-45). This could lead to lek abandonment. Id. These impacts to breeding, nesting, and brood-rearing sage grouse constitute unnecessary and undue degradation pursuant to FLPMA, particularly in light of available alternate routes for hauling ore and yellowcake to and from the Sweetwater Mill.	The commenter's suggestion that noise impacts exceeding 10dBa would be significant is noted, but the BLM reminds the commenter that the BLM is not limited to a finding of no significant impacts through the development of this EIS, but to disclose the potential for impacts using the best available information. The Wyoming Game & Fish Department will continue to be consulted on impacts to sage grouse from hauling along the Crooks Gap/Wamsutter Road; however, the BLM does not necessarily agree with the commenter's suggestion that these impacts would result in unnecessary or undue degradation of public lands in accordance with the 43 CFR 3809 regulations because sage grouse are not Threatened or Endangered Species (see 43 CFR Subpart 3809.420(b)(8). The BLM has considered alternate hauling routes as part of the FEIS as suggested (see Section 2.6.2.3-Alternate Access Route to Sweetwater Mill). However, these alternate hauling routes were not carried forward for analysis, because these showed similar impacts and no benefits to the greater sage-grouse and/or its habitat as compared to the Proposed Action alternative. The alternate routes also poses greater health and safety risks because it would require travel on US Highway 287 for upward of approximately 52 miles with a higher possibility for human contact and collisions.
83	Wild Earth Guardians	4	4-46			Surveying potentially affected leks near main haul roads, as proposed under the Mitigation Alternative (DEIS at 4-46), is all well and good but does little to mitigate impacts to sage grouse. It is notable that sage grouse populations show a 2-10 year time lag following the initiation of a disturbance before beginning to register declines. Thus, by the time that population declines begin to be noticed by BLM, impacts will have been underway for years, and declines will have been entrenched so as to be difficult to reverse. The time lag explains why adaptive management approaches for sage grouse are far inferior to science-based standards that hold impacts below the threshold of significance.	The BLM does not anticipate that significant adverse impacts to greater sage-grouse populations would occur because the Core Area Strategy is being applied where applicable. The BLM Mitigation Alternative includes measures to require monitoring the leks in order to be in a position to respond to population declines should they be noticed.

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84	Wild Earth Guardians					Given the BLM's Sensitive Species obligation to prevent activities that contribute to the need to protect the greater sage grouse under the Endangered Species Act, any significant impacts to greater sage grouse populations or habitats necessary to this species would constitute undue degradation, which is not allowable pursuant to FLPMA.	The BLM does not anticipate that significant adverse impacts to greater sage-grouse populations will occur because the Core Area Strategy is being applied to the project and alternatives where applicable. The commenter should be reminded that sage grouse are not listed under the ESA; thus, impacts to sage grouse may or may not constitute undue or unnecessary degradation in accordance with the 43 CFR 3809 regulations dependent upon how the State of Wyoming (lead for sage grouse management for Mining projects) chooses to manage sage grouse in regards to this project.
85	Wild Earth Guardians	2	2-36			The project involves a significant amount of vehicle traffic. DEIS at 2-36 and -37. It also involves the potential for heavy truck traffic between the mine site and the Sweetwater Mill (DEIS at 2-38), a route that runs directly through sage grouse Priority Areas for Conservation that have been recommended for heightened 'stronghold' protections by the Service. Truck traffic routes should be required that avoid these sensitive sage grouse habitats, and such routes are readily available (north to U.S. Highway 287, then east and south along U.S. Highway 287, then west along Mineral Exploration Road, a paved and gravel route built to access the Sweetwater Uranium Mill). Such routes would avoid the generation of noise, dust, and behavioral disturbance of sage grouse using habitats surrounding the more direct proposed haul route. Holloran (2005, Attachment 8) documented that main haul roads located within 1.9 miles of an active lek were correlated with declines of sage grouse lek populations, that increased traffic led to increased population declines, and that whether or not the road was actually visible from the lek was immaterial in determining the levels of population decline for which the proximity of roads and traffic were responsible. We are concerned that the use of the Crooks Gap – Wamsutter Road south of the project area for hauling ore and/or yellowcake would result in unnecessary and undue impacts to sage grouse populations in the surrounding Core Area/stronghold habitats.	The Crooks Gap/Wamsutter Road has been utilized in previous decades to haul material to the Sweetwater Mill. The road has also been a well-travelled county road for many years. The RMP limit on distance to leks applies only to new roads (Decision 4104.) The commenter should be reminded that this road is a County Road for which members of the public including Energy Fuels are allowed to drive within use requirements as stipulated by the county (weight, vehicle size...). Energy Fuels would be required to obtain an agreement with the counties in order to haul material along this road. Therefore, the BLM has not identified how undue or unnecessary degradation could result from hauling along this County Road. The BLM has considered alternate hauling routes as part of the FEIS as suggested (see Section 2.6.2.3-Alternate Access Route to Sweetwater Mill). However, these alternate hauling routes were not carried forward for analysis, because these routes showed similar impacts and no benefits to greater sage-grouse and/or its habitat as compared to the Proposed Action Alternative. The alternate routes also pose greater health and safety risks because they would require travel on US Highway 287 for upward of approximately 52 miles with a higher possibility for human contact and collisions.
86	Wild Earth Guardians	3			Table 3.4-18	BLM presents estimated highway traffic surrounding the project area (DEIS at Table 3.4-18), but some of the most important traffic impact associated with the project will occur along gravel access roads leading to the project area from the north and south and passing through sage grouse Core Areas. The BLM has an obligation to determine baseline traffic levels on these roads as part of its NEPA analysis, and in order to successfully estimate the cumulative level of traffic (and therefore impacts to sage grouse) associated with this project. Failure to provide this baseline information on traffic levels on the Crooks Gap - Wamsutter Road is a violation of NEPA's baseline information requirements. The agency also fails to present detailed information on the timing, frequency, and magnitude of truck traffic along this route and what impact that would have, individually and cumulatively, on sage grouse populations.	The BLM's responsibilities are to disclose impacts associated with use of the Crooks Gap/Wamsutter Road, and the FEIS has been updated to ensure that the affected environment adequately describes the existing conditions and use of the road using the best available baseline information so that impacts can be adequately disclosed.
87	Wild Earth Guardians	5	5-25			The project area is located within the Mountain Allotment, which was formerly a part of the Green Mountain Common Allotment at the time of the last rangeland health evaluation. Given the poor range condition of surrounding lands in the Green Mountain Common Allotment (*see* Attachment 10), and BLM's pervasive inability to provide the 7 inches of residual grass cover in uplands and riparian areas for sage grouse to hide during nesting and brood-rearing in this allotment, we are concerned that the additional impacts related to the Sheep Mountain project, including increases in corvids, noise, dust, and vehicle traffic, will serve as the 'straw that broke the camel's back' for sage grouse populations in Core Areas surrounding the project area boundary. BLM has failed to factor in the cumulative impacts of poor range management on sage grouse in the cumulative impact analysis area (see DEIS at 5-25), and in doing so has failed NEPA's cumulative impact analysis requirements.	There are no data indicating that the upland vegetation are not meeting rangeland health standards. Data for the former Green Mountain Allotment and the Mountain Allotment indicate rangeland health problems in riparian areas on public lands. A new management system had been adopted for the Mountain Allotment which the court has found adequately addresses rangeland health. Section 5.4.10 adequately discloses potential cumulative impacts to wildlife including sage grouse and addresses impacts from livestock grazing.

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88	Wild Earth Guardians	3	3-67			We are concerned about the potentially significant impacts of the project to sagebrush obligate passerines and other birds, particularly sage sparrow, Brewer's sparrow, mountain plover, and sage thrasher, which are BLM Sensitive Species and may occur in the project area. DEIS at 3-67. Ingelfinger (2001, *and see* Ingelfinger and Anderson 2004, Attachment 9) conducted a study of sagebrush birds in a western Wyoming gas field and found a significant decline in nesting songbirds within 100m of roads, and also found that as gravel roads increased, densities of sagebrush obligate birds, Brewer's sparrows, and sage sparrows declined, while horned larks (a grassland species) increased. According to his findings, "roads associated with natural gas development negatively impact sagebrush obligate passerines. Impacts are greatest along access roads where traffic volume is high" (p. 69), but "bird densities are reduced along roadways regardless of traffic volume" (p.71). Gilbert and Chalfoun (2011) documented significant declines in sage sparrow and Brewer's sparrow populations with increasing industrialization of their habitats due to oil and gas development. We are concerned that the levels of habitat destruction and fragmentation, project-related disturbance and displacement of birds from otherwise suitable habitats surrounding the project site, and exposure of birds to contaminated grit or caustic chemicals from the heap-leach process or other mining operations potentially constitute unnecessary or undue degradation to these BLM Sensitive Species and their habitats. The screening or capping of open pipes to prevent small birds from being trapped and killed would be necessary under any action alternative that might be adopted.	The BLM believes that the DEIS adequately discloses the impacts to sage obligate birds would be similar impacts to sage grouse. No change was made to the text.
89	Wild Earth Guardians					Using the existing uranium processing mill (Sweetwater Mill) is more environmentally responsible than using heap-leach methods, which open up a whole can of worms of additional opportunities for radioactive contamination of soils, surface waters, and groundwater. However, the existing proposal is to have heavy truck hauling of ore directly south from the Sheep Mountain project area to the Sweetwater Uranium Mill via the Crooks Gap – Wamsutter Road, which traverses 23 miles of sage grouse Core Area established by the State of Wyoming and targeted for elevated protections in the BLM's sage grouse RMP amendment that applies to this area, which also has been recommended for even higher 'stronghold' protections by the Service, and which takes the heavy truck traffic within 2 miles of numerous active sage grouse leks. This will result in significant negative impacts to sage grouse populations breeding at these leks and using nesting habitat within 5.3 miles of active leks. This results in unnecessary and undue degradation to sage grouse habitat and populations due to traffic noise, dust, and disturbance and displacement from vehicle activity. If the project is approved (which we do not recommend) and ore is trucked to the Sweetwater Mill, it should be trucked north to Jeffrey City and then east and south by federal highway, then west on the paved and gravel access roads built (and upgraded) specifically for the Sweetwater Uranium Mill, to avoid traversing the 23 miles of important sage grouse habitats in close proximity to leks that lie south of the project area. BLM needs to evaluate this alternative in detail to meet its NEPA range of alternatives requirements.	Comment Noted.
90	Wyoming Outdoor Council					The BLM Mitigation Alternative should be adopted as the preferred alternative in the final environmental impact statement (FEIS) and should be implemented pursuant to the Record of Decision (ROD) for this project.	Thank you for your comment.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
91	Wyoming Outdoor Council		2-6 4-12			First, two distinct alternatives are identified for processing the uranium ore into yellowcake: on-site heap leach and off-site conventional milling at the inactive Sweetwater Mill. DEIS at 2-6. However, the DEIS does not compare the direct impacts of these distinct processing methods in separate NEPA alternatives, deferring instead to the Nuclear Regulatory Commission ("NRC") analysis at some later date. DEIS 4-12. Such deferral to other agencies is not allowed by NEPA where 40 CFR 1502.14(c) specifically requires inclusion of reasonable alternatives not within the jurisdiction of the lead agency.	The BLM does not agree that these two milling processes require separate alternatives, but the BLM does agree that a comparative analysis between the two options be made; thus, the inclusion of the two processing options under the Proposed Action Alternative. The BLM does not have jurisdiction over uranium milling activities beyond surface management of public lands nor the authority to determine which processing option Energy Fuels should implement as long as the 43 CFR Subpart 3809 requirements are adhered to. Information about the milling process (whether on-site or at the Sweetwater Mill) is provided as context for surface management over which the BLM does have jurisdiction; however, only portions of each of the two processing facilities occur on public lands. Regardless, the BLM has analyzed these options under the Proposed Action Alternative for the purposes of disclosing the difference in potential impacts between the two options because processing is a connected action to the mining operations. For these reasons, the BLM believes that the decision of how to process ore is Energy Fuels' decision.
92	Wyoming Outdoor Council		6-1			Moreover, the failure to invite and include the NRC and other cooperating agencies in this NEPA process violates NEPA. *Colo. Envtl. Coalition v. Office of Legacy Mgmt.*, 819 F.Supp.2d1193, 1215-16 (D. Colo. 2011)(showing that a draft for comment fails to satisfy lead agency duties). Here, cooperating agencies were identified and numerous federal and state agencies "requested to participate as cooperators or consulting agencies and will receive a copy of the document." DEIS at 6-1. The FEIS would be legally infirm if BLM - the lead agency - completes the NEPA process without the involvement of the other federal agencies that wield federal authority and control over the project, including the NRC. Whether the lead agency fails to invite agencies or the "other Federal agency" refuses to participate as a cooperating agency, the absence of cooperating agencies violates the "one EIS" requirement and serves to unlawfully segment the NEPA analysis. 40 CFR 1501.6, 1508.5.	The NRC was invited to be a cooperating agency. There is no requirement that the NRC participate as a cooperating agency. The BLM disagrees that the cited references require that there be only one NEPA analysis for two separate permitting processes: the BLM Surface Management requirements, and the NRC's permitting requirements for the milling process. It is worth noting that the NRC has participated as a reviewer on the BLM's DEIS, and the DEIS has been completed to analyze and disclose impacts for the entire project including both the mining and milling even though the BLM does not have jurisdiction beyond surface management of the milling options.
93	Wyoming Outdoor Council					Further, by conflating these technologies into a single alternative, the direct impacts and comparative effectiveness of mitigation measures of each technology are not subjected to the NEPA "hard look" requirement. The requirement that agencies consider alternatives to the action under review is "the heart of the environmental impact statement." *Fuel Safe Washington v. Fed. Energy Regulatory Commission,* 389 F3d 1313, 1323 (10th Cir.2004)(quoting 40 CFR 1502.14). By failing to compare on-site heap leach and off-site conventional milling with the BLM Mitigation and the no action alternative, the FEIS does not [r]rigorously explore and objectively evaluate all reasonable alternatives." 40 CFR 1502.14(a). Whereas heap leach processing would be carried out using massive quantities of toxic liquids in a 40-acre open air raffinate pond, conventional processing would take place largely in an enclosed industrial facility. The differences between these processing options are stark, and must be presented as separate alternatives to meet NEPA mandates. Also, no distinction is made between the perpetual storage and care of the tailings created by these two processes. This fundamental deficiency of not presenting the processing alternatives for comment as separate DEIS alternatives can be repaired by presenting a new DEIS for public comment that includes the necessary alternatives, mitigation measures, and corresponding alternatives analysis that forms "the heart of the NEPA process." *Id.*	The BLM does not agree that the different approaches to milling require separate analyses. The adequacy of NEPA analysis is not dependent on whether alternatives are separately presented but whether reasonable alternatives are analyzed. The DEIS meets this requirement for a hard look.

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94	Wyoming Outdoor Council					Second, the Lander Resource Management Plan (RMP) ROD makes a number of provisions for environmental protection that do not seem to be incorporated into the current BLM Mitigation Alternative. These provisions should be explicitly incorporated into the BLM Mitigation Alternative and adopted in the preferred alternative. Environmental protection measures specified in the Lander RMP ROD that are not currently explicitly reflected in the BLM Mitigation Alternative include: (see below).	The BLM has completed a detailed analysis comparing the measures described below to the Alternatives and added Measures that apply to the BLM Mitigation Alternative in the DEIS. All RMP resource protections are part of all alternatives whether or not explicitly stated as mitigation or design features. Further., the BLM's responsibility in dealing with surface management of mining operations is described in the 43 CFR 3809 regulations and describes the requirements to prevent unnecessary and undue degradation. Compliance with the RMP does not determine whether unnecessary or undue degradation is prevented, but compliance with the 3809 regulations determines such.
95	Wyoming Outdoor Council					**Soil Reclamation** - Decision No. 1017 - "Require that surface-disturbing activities minimize the surface disturbance footprint to the maximum extent possible to limit the areas requiring reclamation."	See Response to Comment 94
96	Wyoming Outdoor Council					**Soil Reclamation** - Decision No. 1024 - "Utilize management practices, including phased development and BMPs, to achieve reclamation success."	See Response to Comment 94
97	Wyoming Outdoor Council					**Water** - Decision No. 1027 - "Require the use of BMPs and mitigation applied as Conditions of Approval to reduce point and nonpoint source pollution and to prevent groundwater contamination."	See Response to Comment 94
98	Wyoming Outdoor Council					**Water** - Decision No. 1034 - "Avoid the authorization of activities likely to cause accelerated channel erosion and adverse adjustments in channel geometry (dimension, pattern, or profile)."	See Response to Comment 94
99	Wyoming Outdoor Council					**Water** - Decision No. 1035 - "Take actions to improve the biological, chemical, and geomorphic conditions of streams and riparian-wetland areas adversely impacted by BLM-authorized activities or by activities upstream of BLM-administered lands."	See Response to Comment 94
100	Wyoming Outdoor Council					**Water** - Decision No. 1042 - "Require measures to limit degradation of water quality, such as avoiding disturbance of soils with high erosion potential, implementing zero-runoff programs on large-scale surface disturbing activities, and requiring full bonding for site reclamation, and reclaiming abandoned surface disturbances."	See Response to Comment 94
101	Wyoming Outdoor Council					**Minerals** - Decision No. 2002 - "Incorporate proponent committed or BLM Required Design Features or mitigation such as BMPs as Conditions of Approval for any authorized mineral activity for federal minerals, regardless of surface ownership."	See Response to Comment 94
102	Wyoming Outdoor Council					**Minerals** - Decision No. 2003 - "In project level EISs and EAs, require, on a case-by-case basis, the development of a wildlife resource monitoring and mitigation plan to address potential impacts from minerals development on wildlife populations and/or habitat.	See Response to Comment 94
103	Wyoming Outdoor Council					**Grassland and Shrubland Communities** - Decision No. 4015 - "Identify unique plant communities and manage to protect, preserve, or enhance the communities."	See Response to Comment 94
104	Wyoming Outdoor Council					**Invasive Species** - Decision No. 4020 - "Manage weed treatments to maintain and improve greater sage-grouse habitat. Apply Required Design Features and BMPs as Conditions of Approval, such as those in Appendix E."	See Response to Comment 94
105	Wyoming Outdoor Council					**Invasive Species** - Decision No. 4023 - "Require that equipment and vehicles used for BLM-authorized activities be cleaned for seeds of noxious weeds and invasive nonnative species before moving onto BLM-administered lands."	See Response to Comment 94

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106	Wyoming Outdoor Council					**Invasive Species** - Decision No. 4025 - "If the Authorized Officer determines that BLM-authorized activities are contributing to the spread of noxious or invasive species, adjust the terms of the authorized activity to aid in the control of the species."	See Response to Comment 94
107	Wyoming Outdoor Council					**Fish and Wildlife** - Decision No. 4033 - "Choose and implement appropriate mitigation and BMPs/Required Design Features to minimize decreases in habitat function. Mitigate impacts as near to the impact… as soon as possible. Offsite mitigation can be considered."	See Response to Comment 94
108	Wyoming Outdoor Council					**Fish and Wildlife** - Decision No. 4034 - "Minimize adverse impacts to fish and wildlife during the life of projects through project placement and maintenance of connectivity between large contiguous blocks of undisturbed habitat…"	See Response to Comment 94
109	Wyoming Outdoor Council					**Fish and Wildlife** - Decision No. 4036 - "Remove or modify identified wildlife hazard fences that are adversely affecting wildlife where opportunities exist."	See Response to Comment 94
110	Wyoming Outdoor Council					**Fish and Wildlife** - Decision 4041 - "All greater sage-grouse core areas "are priorities for management of fish and wildlife and their habitat." While the Sheep Mountain Project Area may lie just outside of core areas it is clear the area is an important use area for sage-grouse and likely other sagebrush obligate species, so priority should be given to their management.	See Response to Comment 94
111	Wyoming Outdoor Council					**Fish and Wildlife** - Decision 4043 - "To protect wildlife and their habitats, reduce the footprint of surface-disturbing activities and facilities to the smallest size necessary to achieve the purpose for the disturbance without raising safety issues."	See Response to Comment 94
112	Wyoming Outdoor Council					**Fish and Wildlife** - Decision 4056 - Outside of DDAs, wildlife seasonal protections for surface disturbing and disruptive activities apply to maintenance and operations actions where the activity is determined to be detrimental to wildlife (see Appendix F).	See Response to Comment 94
113	Wyoming Outdoor Council					**Big Game** - Decision No. 4066 - "Manage BLM-authorized activities so that the forage requirements of all grazing/browsing animals are met."	See Response to Comment 94
114	Wyoming Outdoor Council					**Raptors** - Provision on page 62 of the Lander RMP ROD.	See Response to Comment 94
115	Wyoming Outdoor Council					**Special Status Species** - Decision No. 4076 - "Develop site-specific measures for BLM-authorized activities to protect… sensitive species. Reduce the footprint of development and facilities to the smallest practical to protect special status species and their habitat. Incorporate Required Design Features and BMPs such as those identified in Appendix E... as Conditions of Approval as appropriate for authorized activities to address adverse impacts to special status species."	See Response to Comment 94
116	Wyoming Outdoor Council					**Special Status Species** - Decision No. 4077 - "Require seasonal restrictions or other identified mitigation as needed to minimize impacts to migratory birds and their habitats protected by the Migratory Bird Treaty Act."	See Response to Comment 94
117	Wyoming Outdoor Council					**Special Status Species** - Decision No. 4098 - "Maintain sagebrush and understory diversity… in seasonal greater sage-grouse and other sagebrush obligate species habitats…" This provision applies to all seasonal habitats, not just core areas.	See Response to Comment 94

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118	Wyoming Outdoor Council					**Special Status Species** - Decision No. 4099 - "BLM is to use the recommendations specified in several listed publications, including its National Technical Team Report, to "minimize adverse impacts to greater sage-grouse from allowable uses" This provision also does not apply just in core areas.	See Response to Comment 94. .
119	Wyoming Outdoor Council					**Green Mtn. ERMA** - Decision No. 6088 - Extensive Recreation Management Areas are to be managed to "address local recreation issues and provide for wildlife dependent recreation activities (Map 39)."	See Response to Comment 94. The ERMA does not preclude industrial use and manages use to protect visitor safety (Decision 6130).
120	Wyoming Outdoor Council					**Green Mtn. ERMA** - As shown on Map 28 of the Lander RMP ROD, the Sheep Mountain Project Area is located on or very near to regional historic trails or intact early highway segments. These should be protected.	The project is near to the Rawlins to Ft. Washakie Road. The BLM evaluated impacts to the Trail from the Proposed Action and found no adverse impacts. Refer to other response on trails.
121	Wyoming Outdoor Council					Incorporating these additional provisions from the Lander RMP ROD into the BLM Mitigation Alternatives for each processing technology will help ensure that BLM meets its obligation to prevent unnecessary or undue degradation of the public lands. Under BLM's hardrock mining regulations, performance standards are required to be met so as to not cause unnecessary or undue degradation. These performance standards include complying with applicable BLM land use plans and taking mitigation actions "specified by BLM to protect public lands." 43 CFR 3809.420(a)(3) and (4). Additionally, minimizing impacts means reducing adverse impacts "to the lowest practical level" and "BLM may determine that it is practical to avoid or eliminate particular impacts." *Id. 3809.5*. Therefore, there is no doubt that BLM can require the additional measures we have identified as mitigation measures specified in the BLM Mitigation Alternative.	The BLM has completed a detailed analysis comparing the measures described above to the Alternatives and added Measures that are applicable to the BLM Mitigation Alternative in the FEIS. Compliance with the RMP does not determine whether unnecessary or undue degradation is prevented, but compliance with the 43 CFR 3809 regulations determines such.
122	Wyoming Outdoor Council					Third, of particular concern are the cumulative impacts of this project. This mine would not be built on a clean slate - on an untouched landscape. Uranium mining has occurred on this site in the past and has left a considerable legacy of unreclaimed lands. The Sheep Mountain Uranium Project would add to this unfortunate legacy. The project area is 3,611 acres and BLM anticipates there could be 929 acres of disturbance. Of this, 356.5 acres would be new disturbance and 572.5 acres would be previous disturbance. There are said to be 419.6 acres of currently disturbed land and 891.7 acres of previous disturbance has been reclaimed. As much as 189.9 acres is under no obligation to be reclaimed. Given these extensive previous impacts which have not been mitigated, the BLM should more fully consider the cumulative impacts of the Sheep Mountain Project and make plans to fully mitigate - specifically, to reclaim - this area. New, additional mining should not be permitted if previous disturbance remains unreclaimed, or is on some indefinite timeline for reclamation. As noted above, under both the Lander RMP and the BLM's hardrock mining regulations there is no doubt BLM can - and must - decline to approve new, additional disturbance while prior, severe environmental impacts remain unresolved.	Energy Fuels is under no obligation and the BLM has no authority to require that the existing disturbances that have no reclamation obligations be reclaimed. By authorizing the Plan of Operations, the BLM will require the proponent to reclaim any existing disturbance that will be further disturbed. At the conclusion of the Project, these areas will be reclaimed. However, Measures in the BLM Mitigation Alternative consider the option of having poorly reclaimed or unreclaimed sites reclaimed by the proponent to offset the amount of disturbance that might be taken out of public domain through transfer to the DOE or the State of Wyoming for long term care and maintenance.

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123	Wyoming Outdoor Council					Fourth, the plan for on-site heap leach recovery of uranium at the ore processing facility is not fully developed, disclosed, or analyzed in the Sheep Mountain DEIS. Heap leach recovery facilities would apparently cover 40 acres of the project area, including in addition to the heap leach pad treatment ponds, an extraction plant, and a processing and packaging plant. The potential for water pollution resulting from heap leach operations is high. Site stabilization and groundwater remediation of uranium mill tailings has cost the U.S. taxpayer billions of dollars over the past three decades. The BLM must ensure that this does not occur and that there is adequate mitigation in place to ensure there is no contamination of local waters, either surface or groundwater. An adequate bond must be established based on the known and ongoing expense of cleaning up other heap leach sites, such as the Durita heap leach project in Western Colorado. Although Hecla Mining Company's Durita project provides a real-world example of the difficulties in safely operating and remediating a heap leach project, the experiences at Durita are not mentioned in the Sheep Mountain DEIS.	The Uranium Mill Tailings Radiation Control Act of 1978 and subsequent efforts by the NRC, DOE, EPA, and state agencies to prevent legacy sites, because of the difficulties created by historic mining and milling practices, has resulted in a more stringent regulatory environment than when the earlier sites were active. Improvements in milling and monitoring technology have also occurred. For example, construction of an unlined tailings pond, which created many of the water contamination issues associated with uranium milling, is no longer an option. A history of heap leach projects which have occurred over time and around the world is outside the scope of this EIS. (For example, the Durita Project involved reworking of residuals, from previous milling efforts, which had been moved to the Durita site and processed in the mid-1990s.) However, the BLM's analysis assumes that all applicable regulations are adhered to and permits obtained, which includes the assumption that the proponent will not abandon the project with an inadequate bond. WDEQ-LQD, BLM, and NRC require and review reclamation bonds annually or as required per regulation for the mining and milling activities, and the DOE (or State of Wyoming) would require funds for the management of any areas requiring long-term maintenance and the proponent will be required to provide funds to allow the DOE(or State of Wyoming) to provide for such long term maintenance as described in Section 2.3.
124	Wyoming Outdoor Council					Last, the DEIS was not prepared by a disinterested third party. Edge Environmental, Inc. which was a preparer and reviewer of the DEIS, has been under contract to Energy Fuels, the project proponent, on a regular basis since at least 2009 to prepare environmental documents and testify on the company's behalf in various regulatory proceedings. In particular, Edge Environmental, Inc. is one of the contractors that helped design and license the Pinon Ridge facility near Paradox, Colorado. Energy Fuels asserted attorney/client privilege for Edge Environmental documents prepared for this project due to their close relationship. The Pinon Ridge license was twice remanded for failure to meet Colorado laws, and a pending order currently holds that license in abeyance while the matter is on remand to an Administrative Law Judge. *Sheep Mountain Alliance v. Colorado Dept. of Public Health and Env't.* 2013CV03239 (Denver District Court, Colorado) (Sept. 3, 2014 Remand Order). Energy Fuels remains a party to the ongoing litigation involving disputed testimony and work product of Edge Environmental. Given its non-disinterested status the BLM should ensure that Edge Environmental does not have an undue influence on this process and should ensure full disclosure of its interest and allegiances. See 40 CFR 1506.5(a) and (c) (outlining agency responsibilities when third parties are involved in the preparation of an EIS, including requiring disclosure of interests and requiring the lead agency to select contractors).	The BLM has complied with 40 CFR 1506.5. Edge operates under the supervision of the BLM which is solely responsible for information and analysis. Additionally, in August 2011, Edge Environmental, Inc. was selected by BLM and hired by Titan Uranium USA Inc. to prepare the EIS for the Sheep Mountain Uranium Project as a third-party contractor. As required, Edge completed the disclosure statement and provided it to the BLM. In Feb/Mar 2012, Titan merged with Energy Fuels Wyoming Inc. As an aside, Edge received the final payment for support work associated with the Energy Fuels Resources' Pinon Ridge Environmental Report in December 2010.
125	Wyoming OSLI					At this time, OSLI has no specific comment on the DEIS document. We appreciate this opportunity to comment and look forward to our continued participation in this process. If we may be of further assistance, please do not hesitate to contact this office.	Comment Noted.
126	Wyoming Game and Fish Department					**Terrestrial Considerations:** We provided comments in July of 2014. We have no additional terrestrial wildlife concerns at this time.	Comment Noted.
127	Wyoming Game and Fish Department					**Aquatic Considerations:** We have provided aquatic comments in previous letters. We have no additional aquatic concerns.	Comment Noted.

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128	INFORM					None of the three alternatives presented in the Draft Environmental Impact Statement appear to satisfy the National Environmental Policy Act's requirement to provide a robust analysis of the proposed action in order to facilitate improved decision-making. The BLM Mitigation Alternative could be significantly strengthened, the No Action alternative is flawed, and additional alternatives that should have carefully analyzed the impacts of various processing methods were not included. Considering the unlikelihood of timely development of mining activities at the project site, BLM should reopen scoping, develop additional alternatives for analysis and develop a new Draft EIS.	The BLM disagrees with INFORM's assertion that the DEIS does not satisfy the NEPA. The alternatives were developed within the BLM's decision making authority and are analyzed appropriately to satisfy the NEPA.
129	INFORM					A fundamental flaw both with the proposed Plan of Operations submitted by the proponent Energy Fuels Inc. and the DEIS prepared by BLM is the failure to definitively characterize how, where and when uranium ore extracted at the Sheep Mountain Project will be processed. The DEIS's two main alternatives, the Proposed Action and the BLM Mitigation Alternative, identify both on-site heap leach processing and off-site conventional processing as part of the project. Or perhaps it's one then the other. Or perhaps neither, depending on the whims of the market. Energy Fuels does not commit to making the significant and hugely important choice of a processing method for a very large uranium project and BLM does not require the proponent to make the necessary choice. Rather, the two main alternatives presented in the DEIS allow the proponent to choose at will in the future what processing method will be selected.	The BLM is under no obligation nor is statutorily required to require the proponent to choose a processing method at this juncture. The two methods of potential processing described as options in the Proposed Action are analyzed separately as the identified options by the proponent under the Proposed Action Alternative because the decision to implement one or the other is entirely Energy Fuels'. The FEIS has been reviewed and revised as appropriate to ensure that assumptions regarding the analysis of these two options are adequately described.
130	INFORM					Naturally, this prevents the serious and significant impacts of uranium processing from being fully disclosed to the public. The impacts from processing the Sheep Mountain ore on site would be drastically different from processing offsite, yet the two options are lumped together and considered to be roughly equivalent in the DEIS as though it's really no big deal which method is chosen. From one perspective, on-site processing would result in the permanent creation of a long-term storage facility for the burial of radioactive byproduct material and other toxic wastes at the Sheep Mountain site at a repository that will be perpetually monitored by the government; off-site processing means that dumping will occur somewhere else. The difference between the two in terms of permanent, site-specific impacts could hardly be more stark, yet the DEIS casually describes the impacts of processing the Sheep Mountain ore under either scenario to be roughly the same. This conclusion is not supported by the robust, hard look at the processing question that NEPA requires, with a detailed disclosure of the differences between impacts and how they would occur with the two methods. The ambiguity of which processing method will be implemented must be eliminated from this analysis and BLM shouldn't proceed with further NEPA analysis until the proponent decides what it wants to propose.	The BLM agrees that the two processing methods are entirely different and require separate analysis of impacts, thus the creation of two separate options under the Proposed Action Alternative, but are also options that could occur at the same time so they are analyzed as such, using the best available information, in Chapter 4. The use of a heap leach and long term care and maintenance by the DOE (or the State of Wyoming) are described in the FEIS. The impacts of utilizing an off-site processing facility, such as the Sweetwater Mill, are also described because it is not within BLM's regulatory authority to require the proponent to choose one processing option over another. However, the differences between these two options and the analysis presented in the FEIS have been revised to ensure the analysis is clear.

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131	INFORM					In developing alternatives, it is not BLM's obligation to determine what processing method is economical nor is it appropriate to make decisions about environmental impacts based on economic assumptions. Uranium processing is a dirty business; when undertaken on public lands, BLM is obligated to analyze all the possible alternatives for processing, regardless of economics, in order to determine which method and location are the most protective of the environment, public health and wildlife with the goal of preventing the unnecessary and undue degradation of public lands. It is impossible from the DEIS -- with its lack of information and specificity on the processing question -- to determine which path is best in moving forward. In revising the DEIS in order to fully analyze the impacts of processing, BLM should develop additional alternatives that address the question of multiple processing options. This could include an alternative for on-site processing with mitigations, an alternative for off-site processing with mitigations, and an alternative for phased or sequential processing for both types. Although the proponent has rejected the development of an on-site conventional processing mill as too costly, that does not preclude the analysis of such a facility in an alternative in order to inform the comparison of impacts between multiple processing options. The specific impacts of all reasonable alternatives -- regardless of whether they will be implemented -- must be disclosed in order to provide a valid means of comparison and enable good decision-making, but the DEIS has failed to do so.	The NEPA does not require that the BLM analyze all of the possible alternatives for processing, but that the BLM rigorously explore and objectively evaluate all reasonable alternatives. Therefore, reasonable alternatives were determined to be those with the potential to be implemented by the proponent that are not speculative which includes on-site heap leach processing and off-site conventional processing with the Sweetwater Mill as the most appropriate location. The Proponent has clarified this approach. The FEIS has been reviewed and revised appropriately to ensure this is clear.
132	INFORM					Heap-leach processing is an outdated technology that has outlived its usefulness, particularly in the production of uranium, and has not been utilized domestically for processing this mineral for several decades. Throughout the history of uranium mining in the United States, heap-leach processing has never been deployed responsibly without causing contamination. Regulations for heap-leach processing have not been seriously analyzed since the NRC's Final Generic Environmental Impact Statement (GEIS) on Uranium Milling in 1980. NRC is currently reviewing its guidance for the procedural review of heap leach facilities, but the process is not complete. The Environmental Protection Agency is currently involved in a multi-year rulemaking of its NESHAPS Subpart W regulations. The proposed rule does not establish new standards for heap leach facilities to monitor radon emissions. Because the framework for regulating heap-leach processing and conventional uranium mining is so outdated, the public can have little confidence that its interests will be protected if projects are approved without taking the time to substantially update and approve the relevant standards. In the face of outdated regulations and the lack of a modern EIS that could satisfy NEPA's tiering requirements, there is no question that a full EIS with a very broad scope is needed for this particular project.	The proponent has identified heap leaching as a viable processing option for which the BLM has analyzed in the FEIS to ensure unnecessary and undue degradation will not occur to public lands. This analysis is based off the best available information. The BLM does not agree that heap leaching is an outdated and poorly regulated processing option for uranium. Approval of the Heap Leach and processing facility would be required by the Nuclear Regulatory Commission. The NRC's Draft Standard Review Plan for Conventional Uranium Mill and Heap Leach Facilities (NUREG-2126) is currently in the public review/comment process. NRC's guidance for addressing NEPA requirements for the licensing of uranium recovery operations (NUREG-1748) was updated in 2003.

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133	INFORM					Heap leach processing at the Sheep Mountain Project poses significant risks for future groundwater contamination that have not been adequately reviewed in the DEIS. Where Energy Fuels initially proposed a double liner system for this project and eventually revised it to include a triple liner system, the long-term integrity and viability of such systems still remains unproven. The project will include a significant number of impoundments and stormwater management structures over a large acreage, but the DEIS fails to include a definitive groundwater analysis that delineates how the contamination of ground waters will be prevented should leaks, spills or other failures occur. There is also a lack of evidence and analysis to support the DEIS's conclusion that discharges into Crook Creek will not result in the contamination of connected ground and surface waters. BLM should carefully consider the likelihood that the Sheep Mountain Project will stand idle for extended periods due to economic conditions, increasing the likelihood that contamination events and the release of radionuclides or heavy metals will occur due to reduced oversight at the mine. BLM should conduct a detailed hydrological analysis that determines the relationship between surface and ground water flows at the site in order to determine how to reduce impacts and develop the best mitigation methods. Especially in this context and due to the high degree of concern for scarce water supplies, a "hard look" at this issue in the DEIS is required under NEPA.	As discussed in Section 2.3.3.7 of the EIS, the NRC has the primary responsibility to authorize the On-Site Ore Processing Facility due to the presence of 11(e)(2) byproduct material, and the NRC licensing process would require separate and additional environmental review under NEPA. The presumption that groundwater contamination would occur should a spill, leak, or other failure occur omits the measures that would be required by the NRC to reduce the potential for, and mitigate the impact of, leaks, spills, or other failures, and omits the response measures that would be required by the NRC in the event of a leak, spill, or other failure. Groundwater monitoring would be an integral part of the NRC monitoring requirements for the On-Site Ore Processing Facility. As noted in the Response to Comment 72, the exchange of surface water and groundwater was considered in the development of the FEIS, and the potential impacts of the Project on surface and groundwater were considered minimal based on the site history, current conditions, and the proposed work. To help ensure this evaluation is confirmed, continued surface and groundwater monitoring are part of the Project. Interim mine stabilization is only allowed under specific circumstances (Section 2.3.5.10 of the FEIS) and will be implemented during periods of non-operation to ensure unnecessary or undue degradation does not occur. WDEQ-LQD requires public notice if an operator requests interim mine stabilization (LQD NonCoal Rules, Chapter 3, §3(k)(ii)(E)(I)). It is speculative for BLM to assume that these periods of non-operation would increase the likelihood of contamination because the interim management plan would fail as suggested.
134	INFORM					The Sweetwater Mill has not processed ore since the early 1980s, has been on standby status for the past 20 years, and has just recently initiated a license renewal process with the Nuclear Regulatory Commission. It is unlikely that it can simply turn itself back on. The DEIS has not considered the full implications of what a reopening of the Sweetwater Mill would mean, not only to site-specific impacts related to the Sheep Mountain Project, but to the cumulative impacts of uranium production in the broader region. Reopening the Sweetwater Mill to process Sheep Mountain ore would likely anticipate the need to process additional ore streams from other mines or alternate-waste feeds in order to make processing economically feasible. The DEIS fails to analyze the socioeconomic and environmental impacts of this on a regional scale.	The EIS has been reviewed in detail and revised as appropriate to ensure that the impacts of utilizing the Sweetwater Mill are adequately disclosed; however, the BLM cannot speculate all unanticipated impacts as a result of re-opening the mill and can only disclose impacts using the best available information which includes the assumption that all applicable rules and regulations are adhered to. This would include updating necessary licenses with the NRC which may or may not require additional NEPA analysis. Additionally, the BLM has no evidence to speculate that reopening the mill would encourage other similar operations to spring-up in the nearby area. The BLM feels that the socioeconomic impact analysis in the FEIS adequately describes the impacts as a result of processing at the mill.
135	INFORM					In August 2013 Energy Fuels Inc. acquired the Lower Gas Hills Project in Fremont County, Wyoming, for which BLM is conducting a NEPA analysis as well. Following this acquisition, Energy Fuels publicly announced that it was considering the development of a joint processing facility that would serve both the Sheep Mountain and Lower Gas Hills projects in an off-site location and informed NRC of the change in its planning. A joint processing facility is a reasonable alternative for the development of these projects. The possibility of this scenario occurring in the future should have been analyzed in the DEIS.	The Lower Gas Hills Project has been withdrawn by Energy Fuels, and no development at this location is currently proposed. Further, Energy Fuels has clarified with the BLM that the processing options described in the FEIS are consistent with their plans, and any other options such as joint processing from the Lower Gas Hills Project are speculative. Therefore, this scenario was not considered in this EIS.
136	INFORM					In February 2014, Energy Fuels informed the NRC that it intended to delay submittal of a license application for the Sheep Mountain Project indefinitely because it was evaluating other processing options. Thus, the NRC license application and its concurrent environmental and safety analyses are not proceeding. This presents troubles for the BLM's DEIS, which inappropriately defers to the NRC analysis to address significant areas of the proposal and fails to compare the direct impacts of both these processing options, as required by NEPA. BLM cannot simply shrug off this responsibility, particularly since the NRC may never actually complete the analysis if the proponent does not reinitiate it. Consultations with other agencies, such as NRC or the U.S. Fish & Wildlife Service, must be complete in order to fully analyze and disclose the impacts of the proposed action.	The FEIS has been revised to ensure that it is clear that the intent of the document is not to defer environmental analysis to the NRC regarding the processing facilities, but that the BLM must assume that Energy Fuels will obtain approval from the NRC prior to beginning operations because they cannot construct the processing facility without NRC approval. Thus, the analysis is not deferred, but it is based off of the best available information. The BLM disagrees that Energy Fuels has to complete all consultations with applicable agencies for BLM to analyze the Proposed Action. The analysis assumes all applicable consultations and permits will be obtained.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
137	INFORM					After closure, the on-site processing facility will be reclaimed and turned over to the Department of Energy or the State of Wyoming for permanent management and oversight. Part of the permanent closure area is BLM surface land, which will be withdrawn from public ownership. This is an inappropriate use of public lands. BLM cannot approve operations on public lands that cause their "undue or unnecessary degradation". By definition, creating a radioactive impoundment that must be perpetually monitored is an act of debilitation that permanently degrades the public's asset. In the DEIS, BLM should consider altering the location of the on-site processing facility; since it is already partly located on the disturbed McIntosh Pit and partly on private lands, it may be feasible to move the footprint southward so that it is located entirely on private acreage. Certainly, where the opportunity to locate the facility entirely on private lands exists, a request from a private corporation to dispose of public lands in such a fashion should not be entertained at all. If a thorough analysis determines that the facility cannot be located entirely on private lands and a withdrawal of BLM surface lands cannot be avoided, at minimum the proponent should be required to offset the loss of this acreage by acquiring lands elsewhere, suitable for wildlife habitat, that can be donated back to the public.	The BLM does not agree that transfer of a processing facility to the DOE (or the State of Wyoming) for long term care and maintenance constitutes unnecessary or undue degradation as suggested. Additionally, the BLM does not agree that the BLM can require an operator to move operations off public lands to private lands. A description of other possible locations for the facility is provided in the alternatives considered but eliminated from detailed analysis (Section 2.6). Further, the BLM has considered in the BLM Mitigation Alternative the possibility of requiring reclamation of areas previously disturbed within the Permit Area to offset the area to be transferred to the DOE (or the State of Wyoming).
138	INFORM					The stormwater management controls appear to be subject to a number of different standards, none of which appear suitable to fully protect contaminated waters from flowing offsite during major storm events. BLM is required to consider the impacts of climate change in the DEIS, including the potential change in intensity of storm events. As discussed in Chapter 2, BLM is allowing the minimal standard required by the State of Wyoming to engineer the stormwater sediment ponds around the pit mine areas to withstand a 10-year flood event. For a project that will last many decades longer than just the first, this standard is obviously inadequate to protect the environment. Likewise, it makes little sense for BLM to implement a 100-year storm event standard on other collection ponds. In the light of changing climate conditions, it is unlikely that this standard is sufficient to protect the environment over the long term. BLM must fully analyze and disclose the potential for these impacts in the next draft of the EIS. Engineering standards for stormwater management structures should be overzealous in their effort to prevent offsite releases of contaminated waters and their actual capacity should be disclosed.	See Response to Comment 39 with respect to the design of surface water control features and with respect to climate change.
139	INFORM					Weekly inspections during operating and intermittent periods should be required. Monthly inspections during temporary shutdown periods are not frequent enough to prevent the excessive release of contaminants if spills or leaks go undetected.	Energy Fuels will monitor in accordance with their monitoring plans, and BLM and WDEQ will review completed monitoring to ensure unnecessary or undue degradation is prevented.
140	INFORM					Solid waste materials generated in the sediment, raffinate, holding and evaporative ponds should have a specific management plan for disposal if they cannot be reprocessed at the on-site facility. The DEIS does not identify how or where all of the various evaporates and sludges generated onsite would be disposed.	Waste considered 11e2 byproduct material would be disposed of in the heap pad as described in Section 2.3.5.5 of the FEIS.
141	INFORM					Geochemical testing of waste rock should be required in order to determine whether it can be safely used in combination with cement and fly ash for backfilling the underground workings of the mine. A hydrological study should be required and its recommendations implemented in order to prevent the leaching of mineralized waste rock into groundwater supplies from backfilling the pits or underground workings.	Section 2.3.4.3 of the FEIS has been corrected to remove the reference to use of fly ash as part of the stabilization material. Per WDEQ-LQD Permit to Mine 381C, as approved by WDEQ-LQD in July 2015, fly ash will not be used as part of the stabilization material. The historic mining activities at the site, including pit backfilling and cycles of mine dewatering and recovery, have provided information on the response of the groundwater system to the activities similar to the proposed project. Groundwater quality has generally remained stable.

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142	INFORM					Regular water quality testing of the mine pool should be undertaken before the water is recycled for dust suppression or other land applications on the surface. Water that does not meet agricultural standards at a minimum should not be used for dust control on roads, underutilized or undisturbed sections of the project area, or on spots that are adjacent to wildlife habitat or grazing allotments.	See Response to Comment 20 with respect to the water that would be used for dust control.
143	INFORM					Reclamation standards should require surface radiation levels to be returned to the established pre-mining baseline. For areas that are to be used post-mining specifically for recreation, such as trails and hunting stations, surface radiation should be returned to background in order to achieve the highest possible protection for members of the public that will use the areas in the future. Care should be taken to examine the condition of access roads in and out of the project area post-closure to ensure that any residual radioactivity present in roadways is fully mitigated to background radiation levels. A standard for radiological contamination at the site should be established to initiate cleanup action when standards are exceeded.	The Proponent's reclamation plan requires radioactive materials be handled and segregated separately so as to minimize potential hazards. This would similarly be true for roadways during reclamation; however, setting standards establishing background, pre-mine standards would be unattainable considering the previous mining activities that have occurred on site.
144	INFORM					A specific management plan for the ore pad and ore stockpile areas should be developed and implemented. The DEIS does not address the impacts of the long-term storage of ore onsite during periods of closure and inactivity. The analysis should include the impacts of radon releases and fugitive dust emissions from ore piles that remain on site for extended periods of time because processing has ceased.	The MILDOS Model completed for the Project included analysis of large amounts of ore stored at the ore pad for extended periods of time as suggested. The FEIS has been reviewed and revised as appropriate to ensure this information is described adequately. Further, the interim management plan filed for the Project includes a requirement that mining of ore cease and exposed ore be transferred to the processing facility during periods of non-operation.
145	INFORM					Locate facilities in order to reduce their impacts to wildlife habitat and migration	A discussion on alternate facility locations is provided in the Alternatives Considered but Eliminated from detailed analysis Section of the FEIS.
146	INFORM					The impact to birds from the Sheep Mountain Project is of particular concern, both to the federally threatened greater sage-grouse and to other resident and migratory species that use the area. Special mitigation measures to protect raptors and other species protected under the Migratory Bird Treaty Act should be identified. Seasonal closures should be required when mining activities cause disturbances to nesting or breeding species. The presence of multiple processing ponds at the project poses particular risks to birds that are attracted to water. Vegetation around ponds and catch basins should be carefully controlled in order to deter nesting species. Wherever the size of the pond permits, netting should be used to prevent birds from accessing the water; this method is far preferable to the use of lights or sounds, which can create even greater impacts. In addition, considering that much of the adjacent area and parts of the permitted area are historically disturbed sites in various states of reclamation, BLM should take into consideration the construction of a new freshwater pond and wetlands area as part of a reclamation project. By attracting wildlife to a nearby decoy pond suitable for their use, the impacts to birds and other wildlife could be significantly reduced at the mine's contaminated watering holes.	The commenter is mistaken that the greater sage-grouse is a federally threatened species (Threatened or Endangered Species under the Endangered Species Act). Greater sage-grouse is a candidate species. The BLM Mitigation Alternative as well as Energy Fuels' Plan of Operations includes measures to protect birds from ponds and during sensitive time frames. It should be noted that due to the size of some of the ponds, netting is not a viable option.

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147	INFORM					Because sage-grouse are of special concern in Wyoming and elsewhere, the proponent should be required to enhance the sage cover during the reclamation phase of the project and improve habitat for this particular species. During operations, additional measures can be taken to protect the grouse. Buffer zones as wide as possible should be created in the project area to protect lekking sites, of which the DEIS documents at lease 13 in current use. Recent research has shown that the presence of evaporative ponds at industrial sites is a strong attractant to the sage grouse and contributes to a decrease in nest survival rates.5 Because evaporative ponds have been identified as the primary method to dispose of waste water at the Sheep Mountain Project, the greater impact to sage-grouse in particular should be taken into consideration. Instead of relying on evaporative ponds, all waste water to be disposed of at the Sheep Mountain Project should instead be diverted to a water treatment facility before discharge.	Seed mixes will be required to be BLM approved and will include sage brush species. The nearest greater sage-grouse lek is over 2 miles away. Impacts to greater sage-grouse and potential mitigation measures have been adequately disclosed and the FEIS reviewed and revised accordingly. The Project will indeed include discharge of excess water which will need to be treated as described in Section 2.3.11..
148	INFORM					Finally, the Mitigation Alternative, if it is to be developed as the preferred alternative in the next draft of the EIS, should be specific in identifying a chosen method of processing and developing a management plan that is the most protective of the environment possible.	Thank you for the support of the BLM Mitigation Alternative. See previous comment responses on processing options.
150	INFORM					BLM has failed to develop a reasonable No Action Alternative for this proposal but instead has created an alternative that would more accurately be called the “Permanent Closure Alternative.” This is, in fact, a reasonable alternative to include in the DEIS in order to provide a comparison point between alternatives for their impacts, but it doesn’t meet the mandate to develop and analyze a real no-action alternative. Whether or not BLM has authority to deny this proposal under the 1872 Mining Law does not allow the agency to sidestep its obligation to review a no action alternative. Even if the current proposed action were to be denied, it does not preclude the proponent from submitting and gaining approval of another proposal for the site down the road, allowing conditions to remain at the site as they are indefinitely. In this case, that means the continuing and long-term disturbance of lands, contaminated pit waters, degraded wildlife habitat, and other environmental impacts that remain unaddressed at the Sheep Mountain Project site. These impacts currently exist and are very likely to keep existing into the foreseeable future without being addressed.	The No Action alternative is described in the FEIS and is analyzed similarly to the other alternatives. The BLM has not sidestepped it's obligation to complete a No Action alternative, but has clearly disclosed that the No Action is for purposes of analysis only. The BLM has no obligation to speculate under the No Action Alternative that another proposal could be submitted if the Plan of Operations was denied, or to require that the proponent complete reclamation of sites within the permit area for which they have no reclamation responsibilities.
151	INFORM					Instead of analyzing the actual conditions of the site and what will happen if no new activities are authorized there, BLM has instead developed a No Action Alternative in the DEIS to include the hypothetical closure and full reclamation of the site under the existing permit requirements. This is not the same as “no action” and, in fact, proposes quite a number of smaller actions that could occur at the site in the future in the unlikely event that the proponent decides to fully reclaim and close the property. Again, this scenario for full reclamation is a reasonable alternative to include in the DEIS for the purposes of better understanding and comparing impacts, but it isn’t the No Action Alternative that NEPA requires.	The BLM disagrees that the No Action constitutes something beyond disapproving the Plan of Operations and requiring reclamation of features required to be reclaimed under the WDEQ-LQD Mine Permit. Some reclamation would indeed be required under the No Action Alternative, as required by the WDEQ-LQD Mine Permit and the FEIS analyzes the impacts of this scenario. The DEIS includes a measure in the BLM Mitigation Alternative that considers reclamation of areas within the Project to offset the amount of public land proposed for removal from the public domain through the long term care and maintenance of the onsite processing facility. However, the BLM does not have the authority to require that all lands within the Project Area for which there are no reclamation responsibilities be reclaimed by Energy Fuels. For these reasons an alternative that considers the complete reclamation of all disturbances on site is not reasonable.

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152	INFORM					We also take issue with the assumption in the development of the No Action Alternative that BLM has no ability to deny a mining proposal because of the proponent□s valid existing rights. We disagree with this assumption. Building this assumption into the analysis lends a certain inevitability that conclusions will be drawn and decisions made in advance that are inappropriate and do not serve the public. What BLM is obligated to do is to require that any proposal for this area meet the standards of the law, whether dated to 1872 or not, and to make the best decision possible over use of the land in partnership with the public. If an action on public lands is proposed that causes the undue or unnecessary degradation of public lands then BLM is actually obligated to deny it, regardless of valid existing rights. Only a proposal that balances the proponent's rights with the public interest and sensible and protective management of public resources is one that BLM may approve. In the case of the Sheep Mountain Project, that proposal hasn't come forth yet and hasn't been analyzed in the DEIS.	Mining activities conducted under the 1872 Mining Law (as amended) are non-discretionary actions. The BLM cannot deny a proponent the statutory right to develop mining claims when a discovery has been proven. The commenter is correct, however, in stating that the BLM's decision making authority is limited to ensuring that undue or unnecessary degradation does not occur. The criteria that must be met to prevent undue or unnecessary degradation is described in the 43 CFR 3809 regulations, which includes the requirement that the proponent obtain all necessary permits and authorizations, but does not require that the proponent's rights be balanced with public interest and protective management of public resources.
153	INFORM					Overall, we find the DEIS to be inadequate in its analysis and disclosure of the impacts as well as in the scope of alternatives presented. The lack of a definitive course for processing in the document is particularly troubling. None of the alternatives in the DEIS are satisfactory. The proposed action would create significant impacts to public lands and is not beneficial to the public in its current form. BLM should reinitiate scoping on this project, redevelop the alternatives, finish the required "hard look" analysis and release another draft of this EIS for public review.	The FEIS has been reviewed and revised as appropriate to ensure that all potential impacts are disclosed using the best available information. However, the BLM disagrees that the alternatives and impacts analysis warrant additional scoping and re-issuance of a Draft EIS at this time.
General - 1	Energy Fuels					**Plan of Operations.** As the BLM is aware, Energy Fuels currently holds Permit to Mine No. 381C with the Wyoming Department of Environmental Quality (WDEQ) Land Quality Division (LQD), and a Major Revision to the Permit ("Permit Revision") was issued to LQD in January 2014. This document is referenced in several locations within the DEIS as an update to the Plan of Operations (e.g., Section 1.1 [Project Location and Background]). However, LQD issued comments on the Permit Revision in April 2014, for which Energy Fuels has responded. In late November 2014, LQD issued additional comments on the Permit Revision, for which our response is nearing completion. Through the process of addressing LQD's comments on the Permit Revision, the "Proposed Action Alternative" continues to evolve and become more protective of the environment. As discussed with the BLM on 9 February 2015, the Permit Revision should not be considered an update to the Plan of Operations, but instead supplemental information that provides additional details and clarifications for purposes of the National Environmental Policy Act (NEPA) analysis. Further, Energy Fuels will provide a document to the BLM with specific updates to the Plan of Operations once LQD approves of the Permit Revision, which is anticipated in the near future.	Because the Plan of Operations is the basis for the Proposed Action and refers to the Mine Permit, and the Proposed Action has been updated per Energy Fuels' revisions to the Mine Permit, the Plan of Operations is inherently updated with each revision to the Mine Permit. However, the EIS has been revised to clarify that the Mine Permit submittal provided additional detail and clarifications to the Plan of Operations. The BLM agrees that Energy Fuels should submit an update to the Plan of Operations pending the completion of the Mine Permit to ensure consistency between the two.
General-2	Energy Fuels					**Water Treatment and Discharge.** Based on the site-wide water balance, which is included in the Permit Revision to the LQD, Energy Fuels anticipates that management of excess water will be required commencing in Year 1 of Congo Pit mining, whether or not an on-site processing facility is constructed. As such, treatment and discharge of water to Crooks Creek via a Wyoming Pollutant Discharge Elimination System (WYPDES) permit is anticipated. The 2013 Plan of Operations update stated "should water discharge become necessary, an application to discharge would be submitted to the [WYPDES] program." In several places throughout the DEIS (e.g., Section 2.3.11.3 [Surface Water]), the BLM indicates that additional NEPA analysis may be required for off-site discharge of excess water; however, management of excess water via a WYPDES discharge permit is considered part of the Proposed Action, analysis of which should be included in the FEIS.	The FEIS addresses the WYPDES application submitted to WDEQ-WQD in July 2015. Energy Fuels' consideration of a UIC Permit is addressed in Section 2.6.4 of the FEIS.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
General - 2 Continued	Energy Fuels					The DEIS, as written, appears to include evaluation of WYPDES discharge to Crooks Creek. For instance, Section 4.2.5.1 (Surface Water – Proposed Action Alternative) of the DEIS indicates that, if treated water were discharged to Crooks Creek, a treatment rate of 200 gpm would only be about 20 percent of the lowest measured flow rate in the creek (i.e., 2 cfs). Also, treated water would likely be discharged into an existing ephemeral drainage within the Project Area near the proposed Ore Pad. As such, much of the discharge is likely to infiltrate prior to reaching Crooks Creek, and have an even smaller impact to the flow rates within the creek. Either as an alternative or additional means for managing excess water, if mining of the underground resource is deferred, Energy Fuels is considering discharging untreated (or treated, if required) water from Congo Pit dewatering into the Sheep Underground workings via an Underground Injection Control (UIC) permit. Both the WYPDES and UIC permitting options have been presented to the Water Quality Division (WQD) of WDEQ, and appear to be viable alternatives. As such, Energy Fuels plans to apply for both a WYPDES discharge permit and a UIC permit in the near future to provide operational flexibility. This approach has been discussed with the LQD, and the LQD anticipates including this permit (WYPDES and/or UIC) as a condition of approval to the Permit Revision. Similarly, we believe that analysis of excess water management via a UIC should be included in the FEIS.	See Response above. The EIS has been reviewed and revised where appropriate to ensure impacts to Crooks Creek as a result of the WYPDES discharge have been disclosed.
General-3	Energy Fuels					The August 2013 update to the Plan of Operations provided a map (Figure 1.2-1B) showing the location of the Sweetwater Mill in relation to the Sheep Mountain Project merely for the purposes of analyzing the off-site processing option, with no other reference to the Sweetwater Mill made in the Plan. Section 2.3.4.5.2 (Off-Site Processing) of the DEIS states that "the most likely facility for off-site processing is the existing Sweetwater Mill in Sweetwater County," while the remainder of the DEIS appears to indicate that off-site processing, if performed, would definitively occur at the Sweetwater Mill. Energy Fuels is exploring various options for off-site processing, including the potential to process loaded resin from an on-site heap leach facility at another licensed facility, such as Uranerz's Nichols Ranch. Also, if uranium prices justify such, ore could be shipped to Energy Fuels' White Mesa Mill in Utah. As such, we request that the BLM provide reference to the Sweetwater Mill as a potential off-site processing location for purposes of NEPA analysis only, and remove all other references to the Sweetwater Mill within the document (e.g., Section 2.3 [Proposed Action Alternative], Section 2.3.4.1 [Overview], etc.).	The BLM cannot be expected to accommodate all potential unexpected scenarios in one NEPA document, and the NEPA is not structured to accommodate an analysis of all possible scenarios and options even those that are speculative. The BLM and Energy Fuels have discussed and Energy Fuels has clarified what processing scenarios are reasonable and what are speculative (not reasonable options).
General - 4	Energy Fuels					**BLM Mitigation Alternative.** The BLM Mitigation Alternative focuses on revisions to the Reclamation Plan (Section 2.4.1) and development of a Travel Management Plan (Section 2.4.2). In both instances, the BLM appears to be proposing that Energy Fuels adopt a reclamation plan that includes reclamation and potentially re-reclamation of significant portions of the Project Area that are either outside of the proposed disturbance boundary (i.e., Proposed Action), or not currently bonded for reclamation. We believe that it is not within the BLM's jurisdiction to require Energy Fuels to reclaim disturbed areas outside of the proposed disturbance limit, nor is it within BLM's jurisdiction to require Energy Fuels to re-reclaim previously-reclaimed site areas outside of the proposed disturbance limit to current (and potentially every-changing) reclamation standards.	The BLM has reviewed and revised as appropriate the BLM Mitigation Alternative to ensure the intent and purpose of the alternative is clear in particular the potential for requiring reclamation of previously unreclaimed areas within the permit to offset the amount of disturbance associated with the on-site mill that would be transferred out of the public domain. The decision to implement the BLM Mitigation Alternative or not will be made by the BLM in the Record of Decision

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General-4 Continued	Energy Fuels					Section 2.4.1 of the DEIS states that "the reclamation plan would require that Energy Fuels evaluate reclamation success of previously disturbed areas within the Project Area that have not achieved adequate revegetation and reclaim those areas in order to offset the amount of disturbance of public lands around the processing facility that might be permanently removed from the public domain and transferred to DOE." The maximum acreage that would potentially be removed from the public domain for Department of Energy (DOE) long-term care only equates to about 158 acres (within the proposed NRC License Area), and only applies to the on-site processing option. The proposed maximum project disturbance is 929 acres, and a reclamation plan would be in place to reclaim these areas. As one alternative to removing BLM land from the public domain if an on-site processing facility is constructed, Energy Fuels has proposed a potential land swap with the BLM to offset this acreage.	The BLM reviewed and revised the BLM Mitigation Alternative as appropriate to clarify the amount of disturbance that could be reclaimed to offset the amount taken out of public domain through transfer to the DOE (or the State of Wyoming). The BLM has considered and discussed Energy Fuels proposed land swap options and determined that on-site mitigation through the reclamation of previously poorly reclaimed sites would be the preferred method of mitigation rather than relying on a much more complicated and potentially less advantageous land swap option. Regardless, the BLM has included this potential land swap in the LFO RMP, but will not evaluate it in detail in this EIS because of the uncertainty for on-site processing and other more amenable options available.
General - 4 Continued	Energy Fuels					Section 2.4.1 of the DEIS goes on to say that "some of the unreclaimed areas for which Energy Fuels has no reclamation obligation…would probably meet the reclamation standards…However, other disturbances have shown limited success, particularly some of the AML work according to the standards." It is important to note that, as the land owner, the BLM approved of the Abandoned Mine Land's (AML's) reclamation plans for the Paydirt Pit area and other AML projects on site, and therefore cannot now require that Energy Fuels re-reclaim these areas because they do not meet current BLM standards.	The BLM and AML have refined their reclamation goals and objectives since the beginning of AML's work in this area (1991), and what was once considered an acceptable reclamation practice at the time would no longer be acceptable; therefore, habitat restoration in some of these areas does not currently meet BLM's acceptable standards. The decision to implement the BLM Mitigation Alternative or not will be made by the BLM in the Record of Decision.
General - 4 Continued	Energy Fuels					Of the 3,611 acre permit boundary, approximately 892 acres have been disturbed and reclaimed (68%), while an estimated 497 acres (14%) of this reclaimed area is outside of the proposed disturbance area. However, the current delineations of existing disturbance, as shown on Map 2-5.1 of the DEIS, "exclude" the majority of historic drill roads, which intersect the site extensively. The BLM's enforcement of these and similar proposed mitigation alternatives outside of the proposed disturbance area would add significant costs to Energy Fuels, and, in some case, may be significant enough to threaten the Project's economic viability. As such, these mitigation alternatives are considered to counter to the BLM's obligation to "allow and encourage" the development of mining claims.	The BLM has considered in the Mitigation Alternative a requirement to reclaim some lands which do not currently meet standards as an exchange for land permanently taken out of public domain, and the decision to require this is the BLM's upon the signing of the Record of Decision. However, the viability of requiring reclamation of non-bonded areas to offset the land to be taken out of public domain and the potential financial impacts to Energy Fuels will be considered before submitting the FEIS
EF-1	Energy Fuels	1	1-1		1	Please correct the second sentence to read: "On February 29, 2012, Energy Fuels Inc. acquired the Project through its acquisition of Titan Uranium USA, Inc., and is redeveloping the Project under management of its wholly-owned subsidiary, Energy Fuels Resources (USA) Inc. (Energy Fuels)." The statement currently misstates that Titan and Energy Fuels merged, and that Energy Fuels Resources (USA) Inc. is the parent company, not Energy Fuels Inc.	The sentence has been revised to read as follows: "On February 29, 2012, Energy Fuels Inc. acquired the Project through its acquisition of Titan Uranium USA, Inc. (Titan) and is redeveloping the Project under management of its wholly-owned subsidiary, Energy Fuels Resources (USA) Inc. (Energy Fuels)."
ER-2	Energy Fuels	1	1-1		1	We recommend revising the last statement in this paragraph to read: "Energy Fuels' Permit to Mine 381C permit revision (Energy Fuels, 2014a) submitted to the Wyoming Department of Environmental Quality – Land Quality Division (WDEQ-LQD) in January 2014 was made available to the BLM to provide additional details and clarifications to the August 2013 Plan of Operations." The statement currently indicates that the document was provided as an "update to the Plan of Operation;" however, that document excludes discussion of the proposed on-site processing facility and is therefore not an updated Plan (refer to Section 1.1 of this letter).	The sentence has been revised to read as follows: "In January 2014, Energy Fuels submitted a revision to the WDEQ-LQD Permit to Mine 381C and the revision was made available to the BLM to provide additional details and clarifications to the August 2013 Plan of Operations."

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EF-3	Energy Fuels	1	1-1		2	The last sentence states that Energy Fuels is currently in the process of preparing an application to the NRC for an on-site processing facility; however, this effort has been delayed. We recommend revising the sentence to read: “Energy Fuels will submit an application to the U.S. Nuclear Regulatory Commission (NRC) for a Source and Byproduct Materials License for the proposed Heap Leach and Ore Processing Facility if this path is selected for project advancement.”	The sentence has been revised to read as follows: “Energy Fuels will submit an application to the United States Nuclear Regulatory Commission (NRC) for a Source and Byproduct Materials License for the proposed Heap Leach and Ore Processing Facility if this path is selected for project advancement.”
EF-4	Energy Fuels	1	1-5		Table 1.3-1	With regard to applicable permits, please also include WYPDES discharge permitting and potential for a UIC permit with the other permits listed for WDEQ-WQD. Based on the site-wide water balance, we expect that management of excess water will be required (refer to Section 1.2 of this letter).	Table 1.3-1 has been revised to include a WYPDES Permit and a UIC Permit.
EF-5	Energy Fuels	2	2-4		1	This paragraph indicates that the AML has plans to reclaim the McIntosh Pit in the future. However, the AML commenced reclamation of the McIntosh Pit in mid-2014, and plans to commence Phase 2 reclamation activities in the near future (mid-2015).	The sentence has been revised to read as follows: "Since the early 1980s, the WDEQ Abandoned Mine Lands Division (WDEQ-AML) has conducted reclamation projects on mined areas for which there was no reclamation obligation (i.e., the mining predated the 1969 Act) or limited reclamation obligation, but which pose a safety hazard per WDEQ-AML criteria and for which funding is available."
EF-6	Energy Fuels	2	2-5		Map 2.3-1	Though the proposed disturbance boundary remains the same, we have made some minor modifications to the facility layout with regard to stormwater controls as part of the permitting process with LQD. Specifically, this map shows ponds in locations that differ somewhat from the latest Mine Plan; however, Figure 2.3-3 in the DEIS shows the ponds in the correct locations. Also, this map refers to the proposed processing area as the “NRC License Boundary.” Because a License Application has not yet been submitted to the NRC, we recommend referring to this boundary as the “Proposed NRC License Boundary.”	Map 2.3-1 has been revised as suggested.
EF-7	Energy Fuels	2.3	2-8		Map 2.3-2	This map refers to the proposed processing area as the “NRC License Boundary” and the proposed radiation control boundary as the “Radiation Control Boundary.” Because a License Application has not yet been submitted to the NRC, we recommend referring to these boundaries as the “Proposed NRC License Boundary” and the “Proposed Radiation Control Boundary.”	Map 2.3-2 has been revised as suggested. In addition, "Proposed Radiation Control Boundary" has been changed to "NRC Restricted Area" to be consistent with Map 2.3-1.
EF-8	Energy Fuels	2	2-9		2.3.3.1	A conveyor system would only be constructed if ore is processed on-site, conveying ore from the Ore Pad to the processing facility. This paragraph seems to indicate that a conveyor would be constructed regardless of whether on-site or off-site processing is performed. Also, this paragraph refers to the “Ore Pad” as the “Ore Stockpile,” though the pad area is proposed to contain considerably more than just ore stockpiles (e.g., warehouse, shop, fuel station).	The sentence in Section 2.3.3.1 has been revised to read as follows: 'The Ore Pad and conveyor system (if ore is processed on-site) would be constructed near the entry point to the new proposed double entry decline to the Sheep Underground Mine (see Map 2.3-1). " "Ore Stockpile" has been changed to "Ore Pad" on Map 2.3-1 and throughout the document.
EF-9	Energy Fuels	2	2-9		2.3.3.2	This paragraph indicates that “existing topsoil stockpiles…would be preserved for future reclamation needs.” However, AML plans to use existing topsoil stockpiles TSP-E7, TSP-E10, TSP-E11, and TSP-E12 for reclamation of the McIntosh Pit (refer to Energy Fuels, 2014). As such, the total topsoil volume available from existing stockpiles for use in reclamation of the Project is estimated at approximately 150,255 cubic yards, though approximately 222,200 cubic yards of topsoil are in stockpile within the Project Area.	Please see response to EPA Comment 35, above.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-10	Energy Fuels	2	2-10		2.3.3.4	The water line that extended from the Sheep II Shaft to the McIntosh Pit has been removed to facilitate AML's reclamation efforts.	The following text has been removed from Section 2.3.3.4: " An existing 8-inch water line extends from the Sheep I Shaft to the vicinity of the McIntosh Pit. The pipeline follows the power line from the Sheep I Shaft to the Sheep II Shaft where the pipeline then follows the road and discharges into the existing McIntosh Pit (see Map 2.3-1). This line would be extended to the proposed Ore Processing Facility."
EF-11	Energy Fuels	2	2-11		2.3.3.4	Based on the Congo Pit dewatering model and site-wide water balance completed as part of the permitting efforts with the LQD, we have determined that a water treatment system will be necessary for dewatering of the Congo Pit and Sheep Underground Mine (refer to Section 1.2 of this letter). This facility would be constructed within the limits of the Ore Pad.	The FEIS addresses the WYPDES application submitted to WDEQ-WQD in July 2015.
EF-12	Energy Fuels	2	2-11		2.3.3.6	The last sentence in this paragraph states that "current plans are to utilize the warehouse at the main administration building…" However, the shop and warehouse are proposed to be located on the Ore Pad, separate from the administration office (refer to Map 3-3 in Energy Fuels, 2014).	The sentence has been revised to read as follows: "Current plans are to utilize the warehouse on the Ore Pad to support both the surface and underground operations."
EF-13	Energy Fuels	2	2-12		2.3.3.7.1	The first sentence indicates that the heap leach pad would be constructed in accordance with NUREG-1620; however, this NRC Regulatory Guide pertains to "reclamation" of a uranium tailings storage facility. It may be appropriate to instead state that design of the heap leach pad would be in accordance with 10 CFR 40, including Appendix A to 10 CFR 40. Also, NRC recently issued a draft (for comment) Standard Review Plan (SRP) for Conventional Uranium Mills and Heap Leach Facilities (NUREG-2126) that may be more applicable than NUREG-1620 for design, once it has been adopted.	The sentence has been revised to read as follows: "The Heap Leach Pad would be constructed by excavating the 40-acre pad to design grades in accordance 10 CFR 40, including Appendix A to 10 CFR 40, because the majority of the pad would be below the ground surface. "
EF-14	Energy Fuels	2	2-12		2.3.3.7.1	This paragraph discusses proposed piping and berms for the heap leach pad, but the discussion is not correct as written. The discussion of piping within the heap leach pad itself comes later on p. 2-14 (e.g., collection system). However, this paragraph could be revised to discuss only the application of leach solution to the heap, as follows: "Leach solution would be pumped to the active leach area of the Heap Leach Pad from the Raffinate Pond via a pump and a main pipeline. The main line would be equipped with lateral lines to allow for distribution of the solution over the levelled pad area. A drip emitter system would be used to apply the barren solution to the top of the heap at an established solution application rate."	The paragraph has been revised as suggested.
EF-15	Energy Fuels	2	2-14		2.3.3.7.2	The discussion on sizing of the Raffinate Pond is not correct as currently written (refer to the August 2013 Plan of Operations update). The pond is sized to contain three days of make-up solution, plus three days of leach solution to wet fresh ore, plus the volume of water from a storm event. The DEIS indicates that this pond is sized to contain at least one day worth of lixiviant and leach solution make-up plus a storm event.	The sentence has been revised to read as follows: "The pond would be sized to contain 3 days of make-up solution, plus 3 days of leach solution to wet fresh ore, plus the volume of water from a storm event (e.g., a 100-year, 24-hour event) over the Raffinate Pond."
EF-16	Energy Fuels	2	2-15		2.3.3.7.2	The discussion on sizing of the Collection Pond is not correct as currently written (refer to the August 2013 Plan of Operations update). The pond is sized to contain one day of pregnant leach solution (PLS) from the active leach area plus the volume of a storm event over the Collection Pond and Heap Leach Facility (HLF) areas. The DEIS indicates that the pond is sized to contain more than one day of PLS, plus all solution contained within the HLF, plus the volume of a storm event over the Collection Pond and HLF areas.	The sentence has been revised to read as follows: "The pond would be sized to contain 1 day-worth of PLS from the active leach area, plus the volume of a storm event over the Collection Pond and Heap Leach Pad areas."

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-17	Energy Fuels	2	2-15		2.3.3.7.2	The second to last statement in this paragraph indicates that solids that precipitate out of the liquid waste would be placed within the interim solid “water” management area within the HLF. This should read solid “waste” management area.	The sentence has been revised to read as follows: "Solids that precipitate out of the liquid waste would be periodically removed from the Pond and placed in the interim solid water waste management area within the facility."
EF-18	Energy Fuels	2	2-15		2.3.3.7.2	The last statement in this paragraph indicates that U.S. Environmental Protection Agency (EPA) would have jurisdiction over the ponds associated with the HLF as part of 40 CFR Part 61 Subpart W. Though the EPA has proposed new rulemaking for the National Emission Standards for Hazardous Air Pollutants (NESHAPs) Subpart W that would include heap leach facilities and impoundments (e.g., evaporation ponds and solution ponds) at uranium processing facilities, it is important to note that the proposed Subpart W rulemaking has not yet been finalized. As such, we recommend that the BLM remove reference to the Subpart W rules in this instance, or provide reference that the ponds may be subject to EPA jurisdiction.	The text has been revised to read as follows: "The facility may be subject to EPA requirements (40 CFR Part 61 Subpart W) pending current rulemaking efforts, because the ponds would contain uranium byproduct material (i.e., 11(e)(2) material)."
EF-19	Energy Fuels	2	2-19		2.3.4.2	The first paragraph indicates that excavation of the Congo Pit would intercept groundwater in the 2nd or 3rd year of mining. However, based on dewatering models developed subsequent to the 2013 Plan of Operations (included as part of the LQD Permit Revision and subsequent updates), Energy Fuels anticipates that groundwater will be encountered during year 1 of mining.	The text has been revised to read as follows: "Under the proposed schedule, excavation of the Congo Pit would intercept groundwater in the first year of mining at which point the lower portion of the pit would require dewatering. "
EF-20	Energy Fuels	2	2-30		Section 2.3.5.9 Table 2.3-5	During the permitting process through LQD, the proposed broadcast seed mixture has been revised. Specifically, the rates for Wyoming big sagebrush are increased significantly, and one additional shrub and two additional forbs are included to assist in replacement of the previous Sagebrush-Grass community. The revised broadcast seed mix is as follows (see Energy Fuels' Comment Letter for Seed Mix).	Tables 2.3-5 and 2.3-6 in Chapter 2 (seed mixes) have been revised based on Energy Fuels' Comment Letter.
EF-21	Energy Fuels	2	2-30		Section 2.3.5.9 Table 2.3-6	The proposed drill seed mixture has been modified in the same manner as the broadcast seed mixture (refer to Comment EF-20), as follows (see Energy Fuels' Comment Letter for Seed Mix).	See response to EF-20, above.
EF-22	Energy Fuels	2	2-42		2.3.10.2	In the discussion pertaining to “Groundwater”, the DEIS currently indicates that excess water would not be encountered until “after the first couple of years of operation.” However, based on the groundwater models and site-wide water balance, Energy Fuels (2014) anticipates encountering excess water during the first year of operations. As discussed in Section 1.2 of this letter, Energy Fuels is in the process of preparing applications to the WDEQ-WQD to manage the excess water, with the following two scenarios being considered: Treatment and discharge of excess water to Crooks Creek via a WYPDES discharge permit; and If underground mining operations are deferred, Energy Fuels is exploring the possibility of discharging excess water from dewatering of the Congo Pit into the Sheep Underground via a UIC permit.	The FEIS addresses the WYPDES application submitted to WDEQ-WQD in July 2015. Energy Fuels' consideration of a UIC Permit is addressed in Section 2.6.4 of the FEIS.
EF-23	Energy Fuels	2	2-42		2.3.10.2	In the paragraph on “Ore Processing Waste (11(e)(2) Byproduct Material)”, we recommend removing the reference to the bleed stream flow rates (i.e., 40 gpm and 10 gpm). The process design is still in the early stages, and though these flow rates are our best estimates at this time, they may change.	The text has been revised to indicate that the bleed stream flow rates (i.e., 40 gpm and 10 gpm) are estimates.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-24	Energy Fuels	2	2-43		2.3.11.1	The estimated Congo Pit dewatering rates provided in this paragraph have not been adjusted for water-bearing strata. The Congo Pit dewatering report (included as Exhibit D-6.15 to Appendix D-6 of the Permit Revision; Energy Fuels, 2014) estimates that approximately 60 percent of the Battle Spring formation is comprised of water-bearing sandstone. Based on this adjustment, the total pumping rates are estimated to range from 156 gpm (Year 1) to 377 gpm (Year 4), with an average of 263 gpm, which is less than currently reported in the DEIS.	The discussion of the dewatering rates in the FEIS corresponds with the WDEQ-LQD Permit to Mine 381C as approved July 2015.
EF-25	Energy Fuels	2	2-43		2.3.11.1	Refer to Comment EF-22 regarding the site-wide water balance and excess water management. With off-site processing, Congo Pit dewatering will require excess water management (via a WYPDES discharge permit or a UIC permit); however, if ore is processed on-site, the amount of excess water will decrease significantly, and may be negligible. Regardless of on-site or off-site processing, dewatering of the Sheep Underground is anticipated to require treatment and discharge.	The language has been revised to indicate that dewatering would require treatment and discharge.
EF-26	Energy Fuels	2	2-43		2.3.11.1	See Comment EF-5. The Wyoming AML program commenced reclamation of the McIntosh Pit in 2014.	All references to the WDEQ-AML program in the text have been revised to note that they began reclamation of the McIntosh Pit in mid-2014."
EF-27	Energy Fuels	2	2-44		2.3.11.3	This paragraph states that “in addition to obtaining a WYPDES permit for discharge to Crooks Creek, BLM approval and possibly additional NEPA analysis would be needed.” Refer to the discussion provided in Section 1.2 of this letter.	The FEIS addresses the WYPDES application submitted to WDEQ-WQD in July 2015.
EF-28	Energy Fuels	2	2-47		2.3.12.2	We have the following comments on the “Air” section: - The text indicates that Map 2.3-3 shows the locations of the current air monitors, but station AM-1 (located at the nearest residence) is missing from this map. - All 10 of the air monitors collected a minimum of one year of continuous air samples (text indicates 8 of the 9).	Map 2.3-3 has been revised to show AM-1. The text has been revised to read as follows: "All ten air monitors (AM-1, AM-2, and AM-4 through AM-9) have been collecting continuous air samples for a minimum of 1 year."
EF-29	Energy Fuels	2	2-47		2.3.12.2	Regarding recent vegetation surveys of the site, BKS performed additional vegetation (including wetlands) surveys in 2014. The latest information is available in the LQD Permit Revision (Energy Fuels, 2014).	Chapters 3 and 4 have been updated with the latest information available in the WDEQ-LQD Permit Revision (WDEQ, 2015) and supporting documents (BKS 2013 Vegetation Survey) .
EF-30	Energy Fuels	2	2-49		2.3.12.3	This paragraph indicates that quarterly water levels and annual water quality sampling will occur during operations. However, in accordance with the Permit Revision to LQD, Energy Fuels will be required to perform quarterly groundwater sampling (including water levels) once operations re-commence.	The text has been revised to read as follows: "Groundwater monitoring would be conducted throughout the life cycle of the Project according to the NRC approved license and the WDEQ-LQD Permit to Mine 381C. Groundwater monitoring would be conducted on a quarterly basis for water levels and water quality, including both WDEQ-LQD and NRC water quality parameters. Additional sampling would be conducted as appropriate should a spill or excursion be detected."
EF-31	Energy Fuels	2	2-49		2.3.12.3	This paragraph indicates that “air monitoring would be conducted on a continuous basis” during operations. However, Section 2.3.12.2 (Air) correctly indicates that, pending the outcome of WDEQ-AQD permitting, “the existing [air] monitoring locations…may or may not be needed.” Please revise accordingly.	The text has been revised as follows: "To ensure compliance with 10 CFR 20.1301, 20.1302, and 20.1501, air monitoring would be conducted in accordance with the WDEQ-AQD permit. "
EF-32	Energy Fuels	2	2-52		2.4	The second sentence in this paragraph should be revised to include off-site processing as an option.	The text has been revised to read as follows: This alternative is similar to the Proposed Action Alternative, in that conventional mining techniques would be utilized and uranium would be produced using heap leach and solvent extraction/ion exchange procedures on-site or uranium would be processed off-site."

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-33	Energy Fuels	2	2-53		2.4.1	The BLM indicates that their proposed reclamation plan, which includes evaluation of reclamation success (and potential re-reclamation) of previously reclaimed lands and reclamation of other non-bonded site disturbances, is provided "in order to offset the amount of disturbance of public lands around the processing facility that might be permanently removed from the public domain and transferred to DOE." Refer to Section 1.4 of this letter, as Energy Fuels does not believe it is within the BLM's jurisdiction to require Energy Fuels to reclaim disturbed areas outside of the proposed disturbance limit.	The BLM has considered in the Mitigation Alternative a requirement to reclaim some lands which do not currently meet standards as an exchange for land permanently taken out of public domain associated with the On-Site Processing Facility, and the decision to require this is the BLM's upon the signing of the ROD. However, the viability of requiring reclamation of non-bonded areas to offset the land to be taken out of public domain and the potential financial impacts to Energy Fuels will be considered before making this decision in the ROD. The FEIS has been revised to remove specific mention of the Travel Management Plan and consolidate requirements into Mitigation Measures in order to clarify the intent of this measure.
EF-34	Energy Fuels	2	2-54 & 2-55		2.4.1 Table 2.4-1	BLM's proposed mitigation measures for soils, S-1 through S-3, are all included as part of the current mine and reclamation plans, as discussed in the LQD Permit Revision (Energy Fuels, 2014).	The measures in the WDEQ-LQD Permit to Mine 381C are slightly different than the intent of the Soils measures in the BLM Mitigation Alternative. These measures have been revised to clarify the differences.
EF-35	Energy Fuels	2	2-55		2.4.1 Table 2.4-1	BLM's proposed mitigation measure SW-1 indicates that any water discharged on-site under a WYPDES "would require consultation and approval by the BLM regardless of where the discharge point is located." It is Energy Fuels' understanding that WYPDES discharge permits are issued under the authorization of WQD and there are no additional consultations or approvals needed through the BLM.	Mitigation Measure SW-1 has been removed in the FEIS.
EF-36	Energy Fuels	2	2-60		2.4.1 Table 2.4-1	Regarding "Wetlands and Riparian Zones," and specifically BLM's proposed mitigation measure WT-1, Energy Fuels has completed the process with the U.S. Army Corps of Engineers (USACE), and they determined that no additional permitting is required for the project (correspondence from the USACE is included in Attachment 1).	The BLM has reviewed the USACE's response and determined that the USACE is not as clear in stating that no additional permitting requirements are necessary as Energy Fuels suggests. Therefore, the BLM has revised this measure accordingly.
EF-37	Energy Fuels	2	2-60 & 2-61		2.4.1 Table 2.4-1	BLM's proposed mitigation measures ESA-1 and ESA-10 pertain to sage grouse surveys within the project area prior to site disturbances, and annually within four miles of the Project disturbance, respectively. The Project is outside of the designated sage grouse core area, and sage grouse surveys performed for the Project found no leks on the Project area, or within a two mile buffer (nearest lek 5.25 miles southwest of Project). Though the Project contains some suitable sage grouse habitat (i.e., sagebrush), the habitat is limited to the outer boundaries of the mine permit area. However, since the site is more than two miles from any documented sage-grouse lek, and is outside the core area, we understand that attendance surveys for leks are not required. However, if the BLM maintains these mitigation measures, we request that ESA-10 be revised to include surveys for leks within 2 miles of project disturbance (instead of 4 miles).	ESA-10 has been removed from Table 2.4-1 and Section 4.3.4.2.1 in Chapter 4.
EF-38	Energy Fuels	2	Feb-63		2.4.1 Table 2.4-1	BLM's proposed mitigation measure W-1 indicates that "speed limits of 35 miles per hour from Jeffrey City to the Project Area would be enforced by Energy Fuels." Crooks Gap Road is a county road for which Energy Fuels does not have the jurisdiction to establish speed limits. It is important to note that a number of other developments exist along this road, including other mining and oil and gas projects, and is therefore heavily used by others. The speed limits are set by the county transportation department.	Measures W-1 and ESA-7 (now ESA-6) have been revised to clarify that the measure would require Energy Fuels to implement measures to ensure employees maintain safe speed limits to limit collisions with wildlife. Measure W-1 would not require Energy Fuels to post speed limits on public roads.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-39	Energy Fuels	2	2-65 & 2-66		2.4.1	BLM's proposed mitigation measure CR-3 relates to protection of an identified "cultural resource" (48FR7357) within the reclamation limits of the proposed processing facility. The Wyoming State Historic Preservation Office (SHPO) submitted a letter to the BLM in January 2014 indicating that they did not concur with the BLM's finding that this site is eligible for listing in the National Register of Historic Places (NRHP), and further indicated that the proposed plan would have no effect on historic properties. As such, we request that the BLM remove this mitigation measure from further consideration.	Additional language has been added to CR-3 in response to Comment EF-76 as follows: "If physical avoidance is not possible, interpretive signage would be developed and installed along public roads by Energy Fuels in coordination with the BLM." Although SHPO determined that the site does not retain enough integrity to be considered eligible, it remains historically important as one of only a few early mining camps in the area, and the foundations are intact. Both BLM and SHPO have requested physical avoidance of the site, but are no longer considering visual impacts.
EF-40	Energy Fuels	2	2-66 & 2-67		2.4.1	Based on other statements made throughout the DEIS, BLM's proposed mitigation measure TRA-1 appears to include an inventory all roads within the Project Area, including historic drill roads outside of Energy Fuels' proposed disturbance boundary. Then, BLM's proposed mitigation measure TRA-3 indicates that any roads identified in the inventory without adequate reclamation success would be reclaimed. Refer to Section 1.4 of this letter, as Energy Fuels does not believe that the BLM has jurisdictional authority to require Energy Fuels to reclaim historic disturbances that are neither within the proposed disturbance boundary, nor otherwise not bonded for reclamation with the LQD.	The mentioned TRA-1 and TRA-3 have been replaced (now only TRA-1 and TRA-2) in the BLM Mitigation Alternative, and Measure REC-1 has been updated to clarify the intent of the mentioned measures. However, additional clarifications have been made to the BLM Mitigation Alternative that clarifies the purpose of reclamation of on-site disturbances that do not meet BLM standards to offset lands to be taken out of public domain (this could include abandoned roads that do not meet BLM standards).
EF-41	Energy Fuels	2	2-68		2.4.1 Table 2.4-1	Regarding BLM's proposed mitigation measure REC-1, access to the site during operations will be controlled by Energy Fuels. As such, and for the safety of the public, the site will generally not be accessible to hunters (or for other recreational purposes) during active mining operations. However, abandoned roads which access hazardous areas of the mine would be blocked off, as feasible, during operations for the safety of mine personnel.	Thank you for agreeing with the principles of Measure REC-1 which has been revised for clarification.
EF-42	Energy Fuels	2	2-69		2.4.2	This section indicates that the proposed "Travel Management Plan" would include an inventory of all roads within the Project Area, "including old drill roads", and potentially reclamation thereof. Refer to Section 1.4 of this letter.	The BLM has considered in the Mitigation Alternative a requirement to reclaim some lands which do not currently meet standards as an exchange for land permanently taken out of public domain associated with the On-Site Processing Facility, and the decision to require this is the BLM's upon the signing of the ROD. However, the viability of requiring reclamation of non-bonded areas to offset the land to be taken out of public domain and the potential financial impacts to Energy Fuels will be considered before making this decision in the ROD. The FEIS has been revised to remove specific mention of the Travel Management Plan and consolidate requirements into Mitigation Measures in order to clarify the intent of this measure.
EF-43	Energy Fuels	2	2-79		2.7 Table 2.7-1	With regard to "Wetlands and Riparian Zones", the Proposed Action would have little impact. This is demonstrated by the results of the Aquatic Resources Inventory (ARI) completed in 2014, with concurrence by the USACE (refer to Attachment 1).	The BLM agrees that impacts to Wetlands and Riparian zones are minimal, but disagrees that the USACE letter is as clear as suggested. See comment response to EF-36 above.
EF-44	Energy Fuels	3	3-9		3.2.1.3	This paragraph indicates that the on-site air monitoring stations are "in operation." However, Energy Fuels has placed air monitoring on standby, as sufficient baseline data has been completed for the permitting efforts.	The text has been revised to read as follows: "Nine on-site air particulate monitoring stations were installed, with five stations installed in August 2010 and four in June 2011. All stations are currently on standby."
EF-45	Energy Fuels	3	3-18		3.2.2.2 Map 3.2-4	The Regional Geologic map shows the Fort Union formation outcropping within the Congo Pit area; however, the Battle Spring formation, which overlies the Fort Union formation, is the mineralized zone within the Congo Pit area. For consistency with Energy Fuels' geologic interpretation of the site, including Energy Fuels' geologic cross-sections (included as Figures 3.2-3 and 3.2-4 in the DEIS), we recommend that the BLM adopt use of the amended Stephens (1964) geologic map, included in the Permit Revision (Energy Fuels, 2014).	Map 3.2-4 has been updated to be consistent with the most recent interpretation (Map D-5-2 from WDEQ-LQD Permit to Mine 381C, as approved by WDEQ-LQD in July 2015).

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-46	Energy Fuels	3	3-26		3.2.2.3	The paragraph on “Seismology” references Engineering Analytics (2011). That study was updated and finalized in 2013, and made available to the BLM. Engineering Analytics (2013) indicates that the mean PGA for the 2500-year return period event is estimated as 0.16g at the site, while the mean PGA for the 10,000-year return period event is estimated as 0.58g. These PGA values differ from the values presented in this section.	The text in the Seismology paragraphs has been updated with the 2013 information, and the reference list has been updated.
EF-47	Energy Fuels	3	3-31		3.2.4.1	This section refers to the soil mapping survey completed by BKS in 2010. BKS performed additional soil mapping surveys at the site in 2013 and 2014 to encompass the entire proposed disturbance area. The results of the revised report (BKS, 2014) have been made available to the BLM as part of the Permit Revision (Energy Fuels, 2014).	Chapters 3 and 4 have been revised to include the most recent available data for soils based on the Permit to Mine 381C (WDEQ, 2015) and supporting documents (BKS 2013 Soil Survey).
EF-48	Energy Fuels	3	3-31		3.2.4.1	Refer to Comment EF-47. The salvage depths have been revised somewhat from those presented in this paragraph.	See response to Comment EF-47, above.
EF-49	Energy Fuels	3	3-34		3.2.3.1 Table 3.2-8	The BKS study area was revised somewhat as part of the 2013 and 2014 soil mapping surveys. Refer to Comments EF-47 and EF-48.	See response to Comment EF-47, above.
EF-50	Energy Fuels	3	3-42		3.2.5.1	The first paragraph in the section titled “Crooks Creek Characteristics” discussed flow measurements in Crooks Creek and references Table 2 in Appendix 3-B. The discussion indicates that the measured flows range from 3.3 to 6.8 cfs, while the table shows both lower and higher flow rates. Further, Energy Fuels has collected additional flow measurements at the weir location since 2013 that could be made available to the BLM, upon request.	The text has been revised to read as follows: "In 2010, Energy Fuels placed three gaging sites on Crooks Creek, including locations upstream (XSCCMU), adjacent to (XSCCUS), and downstream (XSCCDS) of the Project Area. The locations of the gaging sites are shown on Map 3.2-11, and Photos 3.2-2 through 3.2-4 show Crooks Creek near the each of the gaging sites (Lidstone, 2013). Energy Fuels has also installed a weir near the location of XSCCUS. Crooks Creek drains approximately 90 square miles above the gaging site XSCCDS. Recorded flows have ranged from 1.8 cfs in August 2012 to 13.5 cfs in November 2013 (see Table 1 in Appendix 3-B)." The tables in Appendix 3-B have been updated.
EF-51	Energy Fuels	3	3-42		3.2.5.1	The discussion on “Surface Water Quality” indicates that surface water quality samples have been collected at two sites on Crooks Creek; however, Energy Fuels has been collecting water quality samples at three sites (shown on Map 2.3-3), which include one downstream site (CC-DS), one upstream site (CC-MU), and one adjacent site (CC-US).	See Response to EF-50, above.
EF-52	Energy Fuels	3	3-46		3.2.5.2	The paragraph on “Project Area Aquifers” indicates that Energy Fuels collected groundwater data in 2010, 2011 and 2013. However, Energy Fuels has been collecting groundwater data since 2010, including data collection in 2012 and 2014. Data pre-2014 is included in the Permit Revision (Energy Fuels, 2014), while data subsequent to that time is provided in the Annual Reports to LQD. Also, this paragraph and elsewhere in this section references Lidstone (2013b) as the baseline groundwater report; however, this should refer to the Lidstone and Wright Environmental Services (2013) report.	The text was revised to read as follows: "Groundwater has been studied at the Project Area since the 1970’s, as part of previous mining activities. To establish the current conditions prior to the proposed Project, Energy Fuels began collecting additional data in 2010, which is included in the WDEQ-LQD Permit to Mine 381C (WDEQ, 2015)." References have been updated to include "Lidstone and Wright Environmental Services, 2013"
EF-53	Energy Fuels	3	3-47		3.2.5.2 Map 3.2-11	The contour corresponding to elevation 6800 feet is mis-labeled as 6000 feet on the potentiometric map.	Map 3.2-11 has been revised as suggested.
EF-54	Energy Fuels	3	3-57		3.3.2	The second complete paragraph on this page refers to field vegetation field surveys completed in the 1980s, as discussed in BKS (2011a). However, BKS performed additional vegetation mapping in 2014, and an updated report is available for use (i.e., BKS, 2014).	Chapters 3 and 4 have been updated with the latest information available in the WDEQ-LQD Permit Revision (WDEQ, 2015) and supporting documents (BKS 2013 Vegetation Survey) .

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-55	Energy Fuels	3	3-58		3.3.2 Map 3-3-1	Additional vegetation mapping was completed by BKS in 2014, which may not currently be reflected on this map, which references BKS (2013).	See Response to Comment 54, above.
EF-56	Energy Fuels	3	3-61		3.3.3	These paragraphs indicate that the USACE will make a determination on the permitting requirements for the Project with regard to aquatic resources. However, the USACE completed their review and found that no permitting with the USACE will be required for the Project (refer to Attachment 1).	The paragraph has been revised to read as follows: "The USACE has determined that no waters of the U.S. occur within the disturbance area, but an extensive evaluation in accordance with administrative procedures implemented by the USACE on June 5, 2007, would be required to determine jurisdiction over streams and wetlands within the Permit Area beyond that area of disturbance (WT-1 in Table 2.4-1)."
EF-57	Energy Fuels	4	4-20		4.2.4.1.1 Table 4.2-12	Refer to Comments EF-47 through EF-49, regarding additional soil mapping performed by BKS (2014), which may affect the acreages reflected in this table.	See Response to Comment 47, above.
EF-58	Energy Fuels	4	4-20		4.2.4.1.1	In response to comments from the LQD on the Permit Revision, BKS (2014) revised recommendations for topsoil salvage to include salvage of any available overburden materials that may be used during site reclamation as available plant growth medium.	The following text has been added: "The presence of suitable plant growth medium or coversoil, in addition to topsoil, was also evaluated, and potential salvage thicknesses ranged from about 1.54 to 2.86 feet. Based on these depths, up to 2,000,000 cubic yards of potential salvageable plant growth medium (coversoil) could be salvaged and stockpiled, depending on accessibility and percentage of large rocks and boulders in the material."
EF-59	Energy Fuels	4	4-20		4.2.4.1.1	This paragraph indicates that all of the currently stockpiled topsoil would be available for reclamation; however, as part of the McIntosh Pit reclamation project, the AML plans to utilize the topsoil stockpiled within that area.	The sentence has been revised to read as follows: "In addition to topsoil, Energy Fuels has identified up to 2,000,000 cubic yards of potential salvageable plant growth medium (coversoil) that would be salvaged and stockpiled, depending on accessibility and percentage of large rocks and boulders in the material."
EF-60	Energy Fuels	4	4-20		4.2.4.1.1	This paragraph mentions that topsoil would be inspected prior to placement. As part of the site work performed by BKS in 2014, the viability of the existing topsoil stockpiles were assessed via sampling and testing, at the request of the BLM.	The language regarding "topsoil would be inspected prior to placement" has been removed from Chapter 4. The following language has been added to Chapter 3: "Additionally, 11 of the 18 topsoil stockpiles, generally the largest of the stockpiles currently on site from previous disturbances, were sampled in June 2014 to verify viability for use as replacement topsoil."
EF-61	Energy Fuels	4	4-22		4.2.4.2.1	The BLM mitigation alternative refers to “stockpile stabilization” measures, indicating that these are not part of the Proposed Action. However, the Proposed Action includes seeding of topsoil stockpiles to minimize loss, construction of a perimeter ditch/berm, and soil amendments, if needed (refer to Energy Fuels, 2014).	The BLM notices differences between measures proposed by Energy Fuels and the intent of the Measures presented in Table 2.4-1 of DEIS. Therefore, these measures have been revised in the FEIS to ensure these differences are noted. H228
EF-62	Energy Fuels	4	4-26		4.2.5.1.1	This paragraph indicates correctly that Energy Fuels anticipates that discharge of water to Crooks Creek would be required, with the rate of discharge dependent on whether or not an on-site processing facility is constructed. However, this paragraph indicates that “BLM approval and possibly additional NEPA analysis would be needed” to discharge treated water. As this is part of the Proposed Action, the current NEPA analysis needs to include any additional assessment of this proposal. Refer to Section 1.2 of this letter.	The Proposed Action description has been revised to ensure that it is clear that a WYPDES permit will be obtained. Analysis of discharge under a WYPDES permit has been completed to the best extent practicable using the available information; however, if additional information becomes available post -EIS completion that negates or is outside the scope of the analysis in the EIS, additional NEPA analysis will be required.
EF-63	Energy Fuels	4	4-26		4.2.5.1.1	The paragraph on the McIntosh Pit indicates that reclamation will occur beginning in 2015; however, reclamation of the pit commenced in mid-2014.	The text has been revised to refer to both McIntosh Pit and Western Nuclear Pond and reads as follows in Section 4.2.5.1.1 : "As discussed in Section 2.5, the reclamation work on McIntosh Pit, including Energy Fuels’ previous reclamation responsibility for the part of the pit, and related improvements to Western Nuclear Pond have been consolidated under the WDEQ-AML Project 16-O."

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-64	Energy Fuels	4	4-28		4.2.5.1.1	The first paragraph in the section titled "Dewatering Discharge" indicates that "during the first couple of years of operation, water discharged from the dewatering system would be entirely consumed on-site." However, the water balance shows that dewatering is likely to exceed consumption, particularly if an on-site processing facility is not constructed. Refer to Section 1.2 of this letter.	The document has been revised accordingly for consistency based off of the most up to date water balance.
EF-65	Energy Fuels	4	4-28		4.2.5.1.1	The second paragraph in the section titled "Dewatering Discharge" indicates that, for discharge of treated water to Crooks Creek, "BLM approval and possibly additional NEPA analysis would be needed, along with revision of the current WDEQ-LQD 381C Mine Plan and Plan of Operations to include reference to the WYPDES permit." The Permit Revision has been revised to indicate that a WYPDES permit will be obtained for the Project, which is anticipated to be a condition to LQD approval of the Permit Revision. Regarding BLM approval and additional NEPA analysis, refer to Section 1.2 of this letter.	The description of the Proposed Action has been revised to ensure that it is clear that Energy Fuels submitted an application under the WYPDES program. Analysis of discharge under the WYPDES permit has been completed to the best extent practicable using the available information; however, if additional information becomes available post-EIS completion that negates or is outside the scope of the analysis in the EIS, additional NEPA analysis will be required.
EF-66	Energy Fuels	4	4-28		4.2.5.2.1	This paragraph indicates that "any water discharged on-site under a WYPDES permit would require consultation and approval by the BLM regardless of where the discharge point is located." Refer to Comment EF-35.	This language has been removed from the FEIS.
EF-67	Energy Fuels	4	4-31		4.2.5.4.1	This paragraph references the drawdown modeling performed by Lidstone; however, Lytle Water Solutions (LWS) has completed recent drawdown and recovery modeling for the Project as part of the Permit Revision, which will soon be made available to the BLM for reference. The results are similar, in that limited drawdown is anticipated beyond the limits of the Project Area.	The text and figures in Section 4.2.5.4.1 have been updated to correspond with WDEQ-LQD Permit to Mine 381C as approved July 2015.
EF-68	Energy Fuels	4	4-32		4.2.5.4.1 Figure 4.2-2	This figure, prepared by Lidstone, could be replaced by the updated modeling completed by LWS. Refer to Comment EF-67.	See Response to Comment EF-67, above.
EF-69	Energy Fuels	4	4-40		4.3.2.2.1	This paragraph indicates that "sites that had previously been disturbed, with or without reclamation, would be subject to the revised Reclamation Plan" outlined herein. However, refer to Section 1.4 of this letter.	The BLM has revised as appropriate the BLM Mitigation Alternative to ensure the intent and purpose of the alternative is clear in particular the potential for requiring reclamation of previously unreclaimed areas within the permit to offset the amount of disturbance associated with the on-site mill that would be transferred out of the public domain. The decision to implement the BLM Mitigation Alternative or not will be made by the BLM in the Record of Decision.
EF-70	Energy Fuels	4	4-41		4.3.2.3	With regard to the No Action Alternative, it should be noted that only the bonded disturbance area would be reclaimed under this alternative (i.e., 241 acres). However, large portions of existing disturbance (i.e., 179 acres) that are within the proposed disturbance limits would not have the benefit of reclamation.	The following sentence has been added to Section 4.3.2.3: "The bonded disturbance (144 acres) would be reclaimed by energy Fuels under the No Action Alternative, and about 302 acres would be reclaimed by WDEQ-AML under Project 16-O. About 190 acres of existing disturbance that are within the proposed disturbance limits would not be reclaimed. "
EF-71	Energy Fuels	4	4-41		4.3.3.1.1	The first paragraph in this section indicates that "jurisdictional status of all wetlands within the Project Area has not been confirmed." However, as noted above, the USACE has determined that no permitting is required for the Project with regard to aquatic resources (refer to Attachment 1).	The first paragraph has been revised to read as follows: "Jurisdictional wetlands would not be affected by the Proposed Action (see Section 3.3.3)."
EF-72	Energy Fuels	4	4-46		4.3.4.2.1	This paragraph indicates that lek surveys should be performed within 4 miles of the Project disturbance (ESA-10). Refer to Comment EF-37.	See Response to Comment EF-37, above.

Comment No.	Comments From	Chapter	Page No.	Lines	Section	Comment	BLM Response
EF-73	Energy Fuels	4	4-48		4.3.4.4.1	This paragraph discusses occurrence of raptor nests within the Project Area. As part of the existing Permit to Mine, Energy Fuels is performing annual raptor surveys, which are included in the Annual Reports to the LQD (with copy to the BLM). As such, Real West completed a raptor survey in 2014.	The text has been updated to include discussion of annual surveys.
EF-74	Energy Fuels	4	4-53		4.3.4.8.1	As part of the referenced BLM mitigation measures for limber pine, this paragraph indicates that "BLM may determine that transplanting some of the healthy limber pine trees to previously disturbed areas within the Project Area would be effective reclamation." (BWSS-1) As a note, the AML is currently maintaining an on-site limber pine nursery as part of the McIntosh Pit reclamation project, and plans to transplant these trees. We recommend that AML's success with this effort be monitored to assess whether or not this is a viable approach for future reclamation at the Project.	Depending on the success of the WDEQ-AML effort, BLM will consider its applicability to the proposed Project.
EF-75	Energy Fuels	4	4-58		4.3.5.2.1	Under the BLM Mitigation Alternative, the BLM indicates that "speed limits of 35 miles per hour from Jeffrey City to the Project Area would be enforced by Energy Fuels." However, the speed limit on this county road is not within Energy Fuels' jurisdiction. Refer to Comment EF-38.	Measures W-1 and ESA-7 (now ESA-6) have been revised to clarify that the measure would require Energy Fuels to implement measures to ensure employees maintain safe speed limits to limit collisions with wildlife. The W-1 and ESA-7 (now ESA-6) Measure would not require Energy Fuels to post speed limits on public roads.
EF-76	Energy Fuels	4	4-62		4.4.1.1.1	Regarding cultural site 48FR7357, it is noted that SHPO determined that the site is not eligible for listing in the NRHP. Prior to the SHPO's non-concurrence with the BLM's recommendation to list the site, Energy Fuels "offered to install signage along Big Eagle Road or Crooks Gap adjacent to the Project Area during construction of the ore processing facility" in lieu of physical avoidance of the feature. Further, this paragraph indicates that the "BLM and SHPO are requesting physical avoidance of the site." This is considered feasible for the off-site processing alternative, but not the on-site processing alternative.	The following language was added to CR-3: "If physical avoidance is not possible, interpretive signage would be developed and installed along public roads by Energy Fuels in coordination with the BLM."
EF-77	Energy Fuels	4	4-76		4.4.4.1.1	This paragraph provides the estimated annual production rates for uranium (388 to 1,736 pound); however, the values reported should be multiplied by 1000.	The sentence has been revised to read as follows: "Under the Proposed Action, estimated annual production would range from a low of 388,000 pounds of uranium in the early years of Operations to a high of 1,736,000 pounds during peak production years (BRS Engineering, 2012)."
EF-78	Energy Fuels	4	4-91		4.4.6.2.1	This section refers to the proposed "Travel Management Plan." Refer to Section 1.4 of this letter.	Reference to the "Travel Management Plan" has been removed in the FEIS.
EF-79	Energy Fuels	5	5-11		5.3.1	This paragraph indicates that AML plans to commence reclamation of the McIntosh Pit in 2015; however, reclamation work commenced in mid-2014.	The sentence has been revised to read as follows: "The WDEQ-AML program commenced Project 16-O in mid-2014."
	Wyoming Game and Fish Department					The WGFD recommends that proposed on-site processing be used to reduce impacts to Greater Sage-grouse in the project area. On-site processing will greatly reduce truck traffic proposed on the existing county roads. On-site processing is proposed in DEIS at the southwest (SW) corner of the project area. The proponent should be aware of the Greater South Pass core area boundary which overlaps the SW corner of the project area. Any disturbance in core area will need to have a DDCT analysis performed.	The FEIS is clear in stating that the decision as to whether on site or offsite processing be completed is that of Energy Fuels' not BLM's. For this reason, the Proposed Action Alternative has two options analyzed separately, on-site processing and off-site processing. The BLM's records and maps of the Greater South Pass core area boundary do not indicate overlap with the Project Area as suggested; rather, the core area boundary is just south and north of the Project Area. However, transportation to the Sweetwater Mill is indeed proposed to occur within core area and is analyzed in the FEIS. There is currently no new disturbance associated with this hauling in core area so a DDCT would not apply.
	Wyoming Game and Fish Department					Due to the proximity of the project site to core area, any on-site processing should include mosquito abatement, to reduce the spread of West Nile Virus to sage-grouse.	The BLM Mitigation Alternative in the FEIS includes measure ESA-4 (formerly ESA-5) to limit potential impacts to sage grouse as a result of mosquitos as suggested.
	Wyoming Game and Fish Department					Fencing should be kept to the minimum needed for safety and marked to reduce grouse mortality.	The BLM Mitigation Alternative in the FEIS includes measure ESA-3 (formerly ESA-4) to limit potential impacts to sage grouse as a result of fences as suggested.
	Wyoming Game and Fish Department					Predators perching and nesting sites should be discouraged to prevent predation on nesting grouse.	BLM Mitigation Alternative in the DEIS includes Measure ESA-2 (formerly ESA-3) to limit impacts to grouse from perched birds as suggested.

Appendix 2-A
Transportation Plan

Transportation Plan

Sheep Mountain Project

Energy Fuels Resources (USA), Inc.
225 Union Blvd., Suite 600
Lakewood, CO 80228

Presented to:

Bureau of Land Management
Lander Field Office
Lander, WY

March 2016

TRANSPORTATION PLAN
SHEEP MOUNTAIN PROJECT

1.1 INTRODUCTION

This Transportation Plan addresses traffic and road use associated with the Energy Fuels Resources (USA) Inc. (Energy Fuels) Sheep Mountain Project (Project). The Project Area is located in Fremont County, Wyoming, approximately 8 miles south of Jeffrey City, 57 miles southeast of Lander, 62 miles southeast of Riverton, 67 miles north of Rawlins, and 105 miles southwest of Casper.

Open pit and underground mining methods will be used to extract uranium ore from the Project Area. For analysis purposes, it is assumed that an on-site processing facility will be constructed and that ore will be processed on-site. It also considers the possibility that an on-site processing facility would not be constructed and ore would be processed off-site (Sweetwater Mill). Based on currently identified resources, the open-pit mine is expected to have an 8 year mine life. Development of the underground mine will be deferred for up to 5 years and is expected to have an 11 year mine life. The overall project life is anticipated to be 20 years from initial construction to completion of final reclamation activities.

The Sheep Mountain Project Area will be accessed using existing federal and state highways and county roads. Access routes and rights-of-way are pre-existing. Within the Project Area, existing roads will require upgrades and new roads will be constructed.

This Transportation Plan addresses roads that may be used to access the Project Area and roads within the Project Area. The plan describes existing roads and roads identified for upgrade/construction; identifies the parties responsible for road maintenance; and estimates traffic levels associated with construction and operation of the Project.

1.2 ACCESS ROUTES

1.2.1 Primary Access Routes in the Vicinity of the Project Area

Road types, or functional classifications, describe the functions that roads serve in facilitating traffic flows within a transportation network. Arterial roads, such as interstates and state highways, connect population centers, accommodate high traffic volumes and have limited access. Collector roads include federal, state, county, and municipal roads that provide primary access through towns or to large blocks of land, and are generally two lanes wide. Table 1 lists the arterial and collector roads in the Project Area’s transportation network that could be used for project access. The table also indicates road surfacing and identifies the parties responsible for road maintenance.

Table 1
Potential Access Routes

Road Name	Road Type	Surface Type	Maintenance Responsibility
US Highway 287	Arterial	Paved	WYDOT[1]
Wyoming State Highway (WY) 135 (Sand Draw Road)	Arterial	Paved	WYDOT[1]
WY 136 (Gas Hills Road)	Arterial	Paved	WYDOT[1]
WY 220	Arterial	Paved	WYDOT[1]
WY 789	Arterial	Paved	WYDOT[1]
Crooks Gap Road (Fremont County Road –CR 318)	Collector	Unpaved[2]	Fremont County
Wamsutter Road (Sweetwater CR 23	Collector	Unpaved[2]	Sweetwater County
Minerals Exploration Road (Sweetwater CR 63)	Collector	Unpaved between Sweetwater CR 23 and Sweetwater Mill, Paved between Sweetwater Mill and Carbon County line	Sweetwater County, Sweetwater Mill[3]
BLM Road 3206	Collector	Paved	BLM, Sweetwater Mill[4]

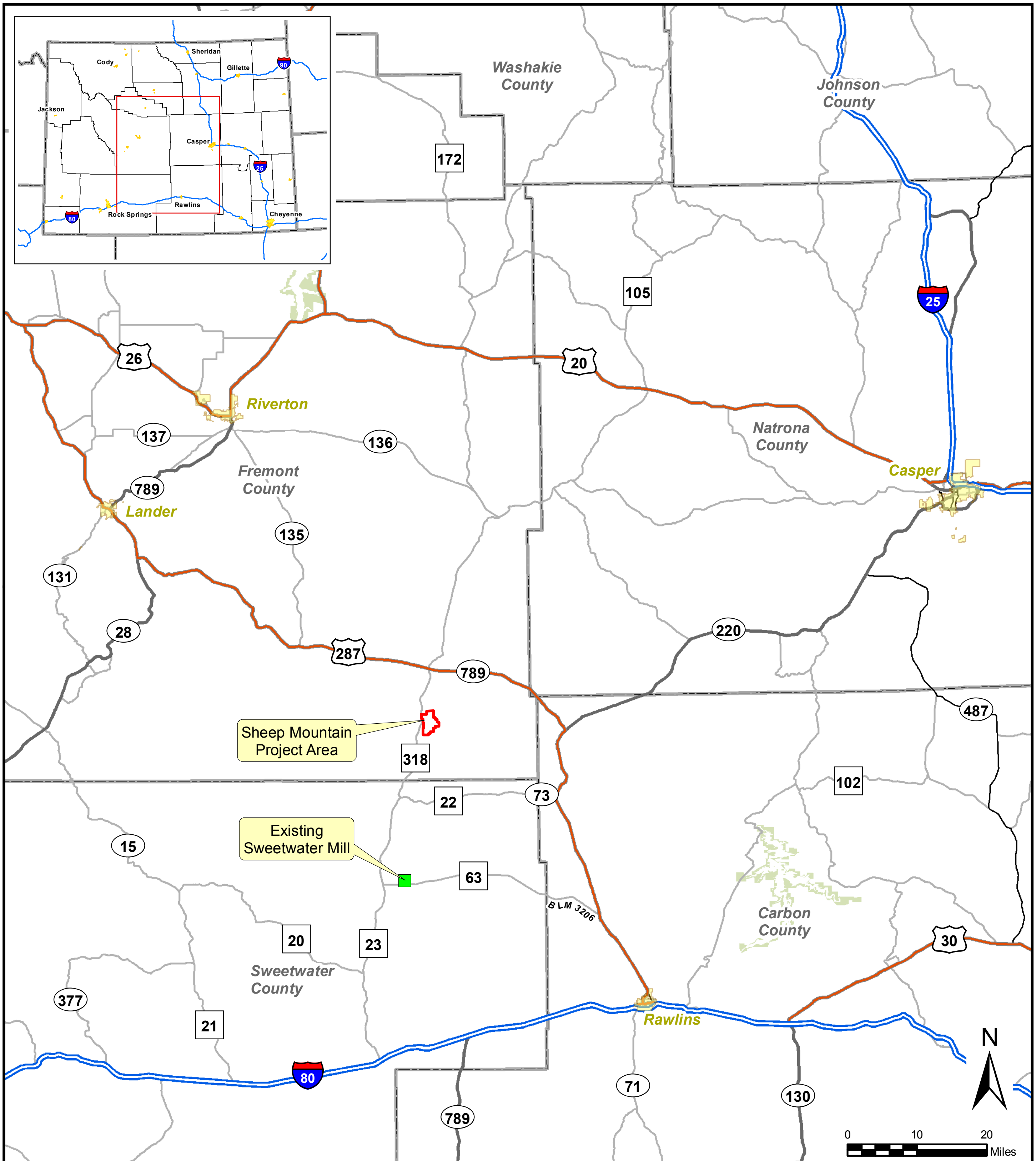
[1] WYDOT = Wyoming Department of Transportation.
[2] Improved gravel surface treated with magnesium chloride.
[3] The Sweetwater Mill conducts road maintenance on county roads 23 and 63 under county road use, improvement, and maintenance agreements with Sweetwater County.
[4] The BLM provides minimal maintenance along BLM Road 3206. The Sweetwater Mill conducts periodic road maintenance under its right-of-way agreement with the BLM.

Local and resource roads include BLM, county, municipal, and private roads that link areas with low traffic volumes to higher classification roads. Local roads connect to collector roads and serve a smaller area than collector roads, and may be one or two lanes with lower traffic volumes. Resource roads provide point access, connecting to local or collector roads, and are single lanes to individual facilities. Primary access routes to the Sheep Mountain Project Area include arterial and collector roads.

1.2.2 Access Routes

1.2.2.1 Access Roads to the Project Area

Travel routes for most workers and supplies travelling to the Project Area are expected to originate in Riverton, Lander, and Rawlins. Some supply routes may also originate in Casper. For off-site processing, trucks will haul ore extracted from the Sheep Mountain Mine to the Sweetwater Mill, which is located 33 miles south of the Project Area (see Map 1).



Map 1

Transportation Plan

Sheep Mountain Project Area Access Routes

Fremont County, WY

From Riverton, Project-related traffic will access the Project Area by heading south on South Federal Boulevard (Wyoming State Highway 789) and turning left onto Wyoming State Highway 136 (WY 136). The access route follows WY 136 for approximately 1.2 miles and merges into WY 135. Traffic will proceed 35 miles south on WY 135 to its junction with US Highway 287 (US 287) at Sweetwater Station and then travel east for 19 miles on US 287 (also WY 789) to Jeffrey City. From there, traffic will turn right onto Fremont County Road (CR) 318 (Crooks Gap Road) and proceed 9 miles south to turn left on Project Access Road, which is the Project Area's primary point of ingress and egress. A secondary access road into the Project Area, Hanks Draw Road, is located approximately 1 mile north of the Project Access Road.

From Lander, Project traffic will travel 57 miles southeast on US 287 to Jeffrey City, and from Rawlins, project traffic will travel 67 miles northwest on US 287 to Jeffrey City. From Casper, project traffic will travel 74 miles southwest on US 220 to its junction with US 287 at Muddy Gap, and continue 23 miles west on US 287 to Jeffrey City. From Jeffrey City, all traffic will use Crooks Gap Road to access the Project Area as described above.

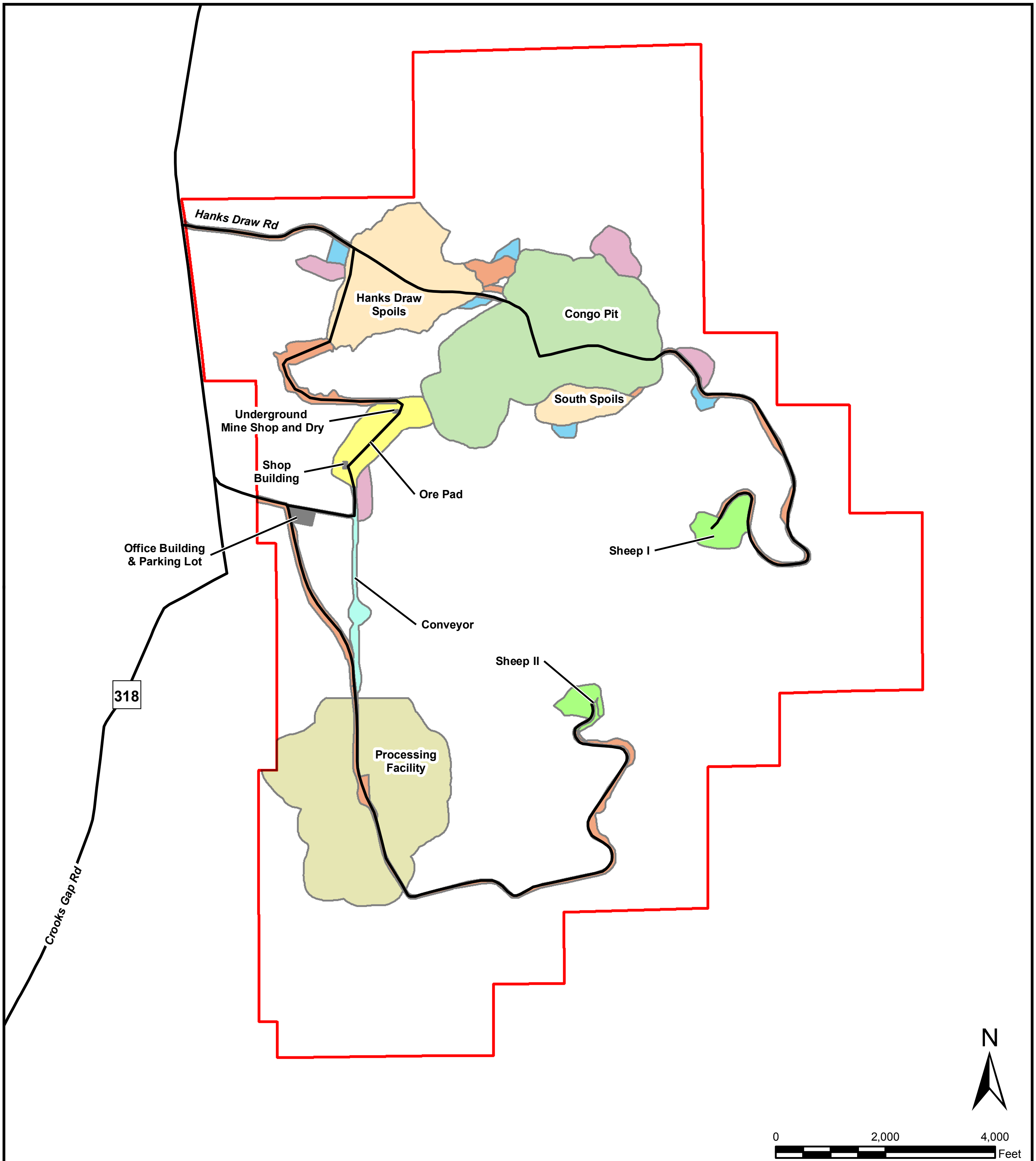
If ore is processed off-site, trucks will haul ore from the Project Area to the Sweetwater Mill by travelling approximately 10 miles south on Crooks Gap Road to enter Sweetwater County, where the road becomes Sweetwater CR 23 (Wamsutter Road), and continuing 16 miles to CR 63 (Minerals Exploration Road). Vehicles will turn left (east) onto Minerals Exploration Road and travel approximately 4 miles to the Sweetwater Mill entry road.

Processed ore from the Project Area will be trucked from the processing facility to a conversion plant in Metropolis, Illinois via Interstate-80. For on-site processing, the processed product will be transported on US 287 to access Interstate-80 at Rawlins. For processing at the Sweetwater Mill, the processed product will travel approximately 20 miles east on Minerals Exploration Road (Sweetwater CR 63) to the Carbon County line. From there, traffic will continue 10 miles east on BLM Road 3206 to access US 287 north of Rawlins. Weather permitting, haul trucks leaving the Sweetwater Mill could also travel 22 miles south on Wamsutter Road to access Interstate-80 at Wamsutter.

1.2.2.2. Access Roads within the Project Area

The Project Area is accessed from Crooks Gap Road by Hanks Draw Road and the Project Access Road (see Map 2). Within the Project Area, existing roads will require upgrades and new road construction will be used to access the project facilities.

Hanks Draw Road will provide access to the Hanks Draw Spoils Facility. The road will be extended along the south side of the spoils pile to access the open pit mine (Congo Pit). During pit operations, a road will be extended along the southern side of the Congo Pit and eastern side of the Project Area to provide continuous access to the Sheep I Shaft to the underground mine.



Legend

- Sheep Mountain Project Area
- Access Roads

Proposed Action Disturbance Footprint

- Congo Pit
- Processing Facility
- Ore Pad
- Pad
- Topsoil Stockpile
- Spoils
- Ponds
- Conveyor
- Roads
- Buildings and Parking

Map 2

Transportation Plan

Roads in the Vicinity of the

Sheep Mountain Project Area

Fremont County, WY

From the site's entry along the Project Access Road, vehicles will proceed east to access the site office. The route forks near the office. To the left, a new road will extend north for approximately 1.7 mile through the ore pad area and Hanks Draw Spoils Facility. Just beyond the main gate, an existing 1.1 mile road will also access the On-Site Ore Processing Facility. An existing 2.0 mile road through the processing facility will provide on-site access to the Sheep II Shaft. The road will be extended around the processing facility to provide continuous access to the Sheep II Shaft.

Use of roads within the Project Area will be restricted to authorized personnel only. Access to the Project Area will be controlled by barbed-wire fencing and/or gates at all defined points of ingress and egress. Public access to the mine and processing facility will be controlled through a single entrance at the Project Access Road with a guard house manned during operating hours and gated at all other times. Hanks Draw Road will be gated and opened for deliveries, maintenance, and inspections on an as-needed basis.

1.3 ROAD CONSTRUCTION AND IMPROVEMENTS

On-site haul roads will be crowned and ditched to quickly shed any direct precipitation, and culverts will be installed to convey runoff from first and second order drainages that are crossed by the haul roads. Berms reaching the midpoint of the wheel of the largest equipment on site will be installed in any area where the potential for equipment tipping exists in accordance with Mine Safety and Health Administration (MSHA) regulations. Berms may be utilized to divide opposing lanes of travel to provide further protection against collision. Haul roads will be surfaced with site-produced sandy gravel passing a 3/8-inch screen, to provide a surface which minimizes tire wear, is easily maintained, reduces fugitive dust emissions, and does not become slick when wet. A motor grader will maintain haul roads on a full-time basis. Off-road water trucks will apply water to roadway surfaces to control dust and promote surface compaction on an as-needed basis. For the use of county roads, as off-site haul roads, road maintenance and improvements will be coordinated with Fremont and Sweetwater counties through road use, maintenance and improvement agreements. These agreements will be finalized prior to road use.

1.4 ROAD MAINTENANCE

Energy Fuels will coordinate with the Wyoming Department of Transportation (WYDOT) and Fremont County, and in the event of off-site processing, Sweetwater County and the BLM so that use of state highways and county and BLM roads is consistent with issued use permits, rights-of-ways, and other state and county requirements. Energy Fuels anticipates that any county road improvement or maintenance, prior to or during construction, will be coordinated through an agreement with the appropriate county. WYDOT maintains paved access roads leading to the Project Area. Fremont County maintains Crooks Gap Road and Sweetwater County maintains the Crooks Gap/Wamsutter Road (4-23) and the Minerals Exploration roads (4-63) (see Table 1). Both counties provide limited winter maintenance on the roads within their jurisdiction. Sweetwater County provides year-round maintenance on the northern portion of the Crooks Gap/Wamsutter Road through an agreement with Lost Creek Uranium. Energy Fuels will coordinate the maintenance of county roads with Fremont and Sweetwater counties based on county road use, improvement, and maintenance agreements that will be implemented prior to road use.

The BLM provides minimal maintenance on BLM Road 3206. It should be noted that this road has a posted 20 ton weight limit. The Sweetwater Mill has a BLM right-of-way on this route and conducts periodic roadway maintenance as part of its right-of-way agreement. In the event of additional commercial use of BLM Road 3206, the BLM would require commercial users to enter maintenance cost-sharing agreements with one another and the BLM.

Energy Fuels will maintain on-site roads in accordance with BLM 9113 Manual specifications (BLM, 2011). Most roads in the Project Area will be wider with greater vertical clearance than those specified in the manual to accommodate large mine equipment. Energy Fuels will be responsible for all maintenance actions necessary to provide all-weather access to the Project Area. In addition, Energy Fuels will provide timely maintenance and cleanup of access roads to pre-existing conditions. Energy Fuels' county road use, improvement, and maintenance agreements with Fremont and Sweetwater counties will include provisions addressing the repair of existing roads due to damages caused by construction and/or operational traffic.

Maintenance will include, but not be limited to: dust abatement; reconstruction of the crown, slope, and/or water bars; blading or resurfacing; material application; clean-out of ditches, culverts, catchments; snow plowing, and other best management practices (BMPs).

Roads will not be bladed directly up drainages and will be designed at right angles to the drainage, as feasible. Roads bladed in drainages will be located a sufficient height above the channel so that fill material does not enter the drainage channel.

Saturated soil conditions may exist when water is flowing on the ground surface. Examples of saturated conditions include: water comes to the ground surface from walking or driving across the soil; the ground surface is spongy when walked upon; ruts 3 inches or deeper result from driving across the ground surface; vehicles get stuck in the mud; or a bulldozer is needed to pull vehicles through the mud. When saturated soil is present, construction travel will be halted until the road dries out or is frozen sufficiently for use to proceed without undue damage and erosion to soils and roads. Road maintenance or upgrades will be conducted when rutting of the travel-way reaches a depth of 3 inches.

Dust suppression will be implemented by spraying water on unpaved roads on an as-needed basis. Magnesium chloride and other surfactants, binding agents, or other dust-suppression chemicals will not be used for dust control without prior approval from the BLM.

1.5 ROADWAY SAFETY

All ore shipments will be conducted in accordance with applicable U.S. Department of Transportation (USDOT) and MSHA regulations. The required documents will be prepared for each shipment and will accompany the shipment to its destination. Federal regulations also mandate that ore shipments be tarped to reduce the potential for accidental spillage or fugitive dust. WYDOT requires commercial carriers to comply with federal regulations covering the transportation of hazardous materials, and has not issued separate regulations. There are no hazardous material route designations in Wyoming.

If ore is processed off-site, ore haulage to the Sweetwater Mill will be contracted to one or more trucking companies who will be responsible for developing and implementing an Emergency Response Plan in the event of an accident, obtaining required road use permits, and obeying all traffic rules. Emergency response and remediation services in the event of an accident may be supported by the Sheep Mountain Mine, provided that the ore haulage contractor requests this service as part of the contractual arrangement. Materials transported to the mine and processing facility will primarily include diesel fuel, chemical reagents for mineral processing, underground mine materials, and explosives. Items transported from the processing facility will primarily consist of concentrated uranium ore (yellowcake), which is a solid product packaged in USDOT-approved 55 gallon drums for shipment. The USDOT requires trucking companies that transport these materials to have emergency response plans in place to respond to accidents and cargo spills. As part of its contracting program, Energy Fuels will verify that its trucking contractors have such plans in place.

1.6 TRAFFIC LEVELS

1.6.1 Construction Traffic

Development Schedule

The Sheep Mountain Project will be constructed under a staggered development schedule. The Congo Pit will be developed sequentially to accommodate the desired mine production and allow for internal backfilling. Because the Congo Pit does not require large pre-stripping, mining personnel will also develop the mine during the project's first year (Year 1). Development of the underground mine will be deferred for up to 5 years after surface mining commences. Construction of the On-Site Ore Processing Facility is expected to begin 6 months prior to development of the Congo Pit.

On-Site Processing

Under the schedule outlined above, traffic related to construction of the On-Site Ore Processing Facility is estimated to include between 40 and 61 vehicle round-trips per day during the first 6 months of project development. Construction of the processing facility will overlap with development of the open pit mine for approximately three months in Year 1, when construction traffic is expected to include between 48 and 71 vehicle round trips per day (see Table 2). Construction of the underground mine is estimated to include between 18 and 25 vehicles a day for approximately 18 months sometime after Year 1. This traffic will overlap with operational traffic at the open pit mine and processing facility.

Off-Site Processing

For transportation to the Sweetwater Mill (if ore is processed off-site), construction traffic will include between 8 and 10 vehicles per day for the open pit mine, and between 18 and 25 vehicles per day for the underground mine. Construction traffic for the underground mine will overlap with operational traffic for the open pit mine.

Table 2
Estimated Range of Vehicle Round-Trips per Day During Construction

Project Component	Project Schedule	Light Vehicles	Heavy Vehicles	Total Vehicles
Open Pit Mine	12 months in Year 1	8 -10[1]	0[2]	8 – 10
Underground Mine[3]	18 Months after Year 1	20 - 25[4]	0[2]	18 – 25
Processing Facility				
On-Site Processing	9 Months in Years 0 - 1[5]	35 - 55[6]	5 - 6[2, 7]	40 – 61
Off-Site Processing	--	0	0	0

Assumptions:
[1] Assumes that between 15 and 20 workers are required to develop the open pit mine. Vehicle estimates include workers' personal vehicles, assuming two workers per vehicle.
[2] Assumes that heavy equipment remains on-site during construction.
[3] Development of the underground mine will be deferred for up to 5 years depending on financing and market conditions.
[4] Development of the underground mine will include between 20 and 30 workers to drive the double-entry decline and 20 workers to conduct rehabilitation in the mine. Vehicle estimates include workers' personal vehicles, assuming two workers per vehicle.
[5] Construction of the processing facility is expected to begin 6 months prior to Year 1.
[6] Includes personal vehicles for 70 to 110 processing facility construction workers, assuming two workers per vehicle.
[7] Includes 302 truckloads of materials delivered between 135 and 270 days. Also assumes that durable rock material is obtained off-site.

1.6.2 Operational Traffic

On-Site Processing

Traffic related to operation of the Sheep Mountain Project is expected to include between 55 and 107 vehicle round trips per day. The lower-bound estimate assumes that the project is operating at less than full capacity with partial workforce levels and the upper-bound estimate assumes that the project is operating at full capacity with peak workforce levels. Operational traffic will be highest when the underground mine will be producing ore. Prior to that time, operations-only traffic is estimated to include between 32 and 43 vehicle round-trips per day (see Table 3).

Off-Site Processing

For processing at the Sweetwater Mill (if ore is processed off-site), operational traffic is estimated to include between 89 and 180 vehicle round trips per day. Approximately half of this traffic will consist of trucks hauling ore from the Project Area to the Sweetwater Mill. During the project's early years, when only the Congo Pit will be producing ore, operational traffic is estimated to include between 57 and 116 vehicle round-trips per day.

Table 3
Estimated Range of Vehicle Round-Trips per Day During Operations

Project Component	Light Vehicles	Heavy Vehicles	Total Vehicles
Open Pit Mine	10 - 21[1]	0[2]	10 – 21
Underground Mine	32 - 64[3]	0[2]	32 – 64
Processing Facility			
On-Site Processing	10 - 18[4]	3 - 4[5]	13 – 22
Off-Site Processing	7 - 15[6]	40 - 80[7]	47 – 95

Assumptions:
1 Includes personal vehicles for between 20 and 41 open pit mine workers, assuming two workers per vehicle.
2 Assumes that mine support vehicles, water trucks and mechanical service trucks remain on-site.
3 At full production, the underground mine is expected to employ 128 workers over two shifts. Lower production levels may require only one daily work shift. The estimated vehicle range includes personal for between 64 and 128 underground mine workers, assuming two workers per vehicle.
4 Includes personal vehicles for 20 to 35 processing plant workers, assuming two workers per vehicle.
5 Includes approximately one yellow cake shipment per week, one delivery of sodium chlorate per week, nine shipments of sulfuric acid per week, two shipments of miscellaneous chemicals (sodium carbonate, hydrogen peroxide, sodium hydroxide, hydrated lime) per week, one fuel delivery per day, and two shipments per week of domestic solid wastes to the Jeffrey City Transfer Station.
6 Includes personal vehicles for between 7 and 15 haul truck drivers, assuming one worker per vehicle.
7 Assumes between 7 and 15 haul trucks make up to 5.3 round trips per day between the Project Area and Sweetwater Mill (assumed cycle time of two hours). Assumes that haul trucks remain on-site when not in use.

Project traffic is expected to peak at 107 vehicle round-trips per day with an on-site processing facility and at 180 vehicle round-trips per day with off-site processing. Peak traffic would occur with both the open pit and underground mines in operations. Development of the underground mine may be deferred up to 5 years, depending on financing and market conditions.

1.6.3 Final Reclamation Traffic

Final reclamation of the Project Area will be conducted for approximately 2 years after mining is complete. Traffic during final reclamation is estimated to include between 32 and 39 vehicle round-trips per day. If ore is processed off-site, final reclamation traffic is estimated to include between 12 and 15 vehicle round-trips per day (see Table 4).

Table 4
Estimated Vehicle Round-Trips per Day During Final Reclamation

Project Component	Light Vehicles	Heavy Vehicles	Total Vehicles
Open Pit Mine	10 - 12[1]	0[2]	10 - 12
Underground Mine	2 - 3[3]	0[2]	2 - 3
Processing Facility			
On-Site Processing	10 - 12[4]	10 - 12[5]	20 - 24
Off-Site Processing	0	0	0

Assumptions:
[1] Includes personal vehicles for between 20 and 24 reclamation workers, assuming 2 workers per vehicle.
[2] Assumes that heavy vehicles required for mine reclamation remain on-site.
[3] Includes personal vehicles for 4 to 6 reclamation workers, assuming two workers per vehicle.
[4] Includes personal vehicles for between 20 and 24 reclamation workers, assuming two workers per vehicle.
[5] Assumes that reclamation will occur over a two year period, and that materials for the radon barrier (i.e. clay), riprap and other durable rock layers will be sourced off-site.

1.7 REFERENCES

Bureau of Land Management, 2011. Manual 9113 – Roads. Manual Transmittal Sheet Release 9-390. October 21.

Bureau of Land Management and Forest Service (BLM and Forest Service). 2007. Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development. Gold Book. Fourth Edition.

Appendix 2-B
Monitoring Summary

Table 1
Summary of Site Environmental Monitoring Program

MEDIA	LOCATIONS	FREQUENCY	PARAMETERS	AGENCY REQUIRING SAMPLING
Surface Water	Crooks Creek: XSCCMU, XSCCUS, & XSCCDS Sediment Ponds As specified in WDEQ-LQD Permit to Mine 381C. Ephemeral Impoundments: SW-2 & SW-3 On-Site Mill (if constructed): New impoundment locations to be determined by NRC.	Quarterly As water is available after rainfall	Field Measurements: Conductivity, DO, pH, Temperature, TSS, Turbidity, & Flow Rate (in creek). Lab Analyses: General Water Quality: Alk,Cond, F, NH4, NO2+NO, pH, SiO2, & TDS Major Cations & Anions: Ca, Cl, CO3, HCO3 K, Mg, Na, K, & SO4 Metals: Al, As, Ba, Be, Bo, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, V, & Zn Radionuclides: Gross Alpha, Gross Beta, Pb–210, Po–210, Ra–226, Ra–228, Th–230, & Unat	WDEQ/LQD & NRC (NRC may require additional sampling as part of license.)
Treated Dewatering Discharge	Outfall	Daily Weekly Monthly Quarterly	# of days of discharge & Oil & Grease Flow & TSS Ra-266, Ra-226+228, Se, U, & Zn COD, pH, & Zn	WDEQ/WQD (per WYPDES permit)
Groundwater	Mine: Existing Wells: MW–6NEW, MW–10, PZ–1, PZ–3, P–4, PZ–8, PZ–9, & PZ-10 New Wells: MW–11, MW–12, MW–13, & MW–14 On-Site Mill (if constructed): G–3, G–4, G-5, G–6, G–7, G–8, & Point of Compliance Wells (new wells, locations to be determined by NRC)	Quarterly	Same parameters as for Surface Water but omit Turbidity & TSS and, in place of Flow Rate add Water Level.	WDEQ/LQD & NRC (NRC may require additional sampling as part of license.)

MEDIA	LOCATIONS	FREQUENCY	PARAMETERS	AGENCY REQUIRING SAMPLING
Air	**<u>Mine: (TBD)</u>** **<u>Mill:</u>** AM-4, -5, -6, -7, -8, -9, -10	As required by WDEQ/AQD Permit (TBD) Continuous measurement, Quarterly sampling	TBD Unat, Ra-226, Th-230, Pb-210 and Radon	WDEQ NRC
Noise	Permit Boundary, Mine Areas (TBD)	Quarterly	dB	MSHA/NIOSH
Soil	Downwind of Mill Area (TBD)	Annual	Unat, Ra-226, Th-230, Pb-210	NRC
Vegetation	Downwind of Mill Area (TBD)	Annual	Unat, Ra-226, Th-230, Pb-210	NRC
Wildlife	Raptors Large Game Sage Grouse	Seasonal, annually Seasonal, annually Seasonal, annually	Visual Observations	WDEQ WDEQ WDEQ

Table 2
Operational Monitoring

MEDIA	LOCATIONS	FREQUENCY	PARAMETER TABLE	AGENCY
Stability/SWPPP	**Mine:** (as per SWPPP) **Mill:** (as per SWPPP)	Monthly, opportunistically after rainfall Monthly, opportunistically after rainfall	Visual observation of landform stability, sediment control, storm water discharge	WDEQ
Early Detection Monitoring	Heap Leach Pad Collection Pond Raffinate Pond Holding Pond Plant Buildings	Daily, Weekly, Monthly Annual	Unat, Ra-226, Th-230, Pb-210, Po-210, SO_4 as per license (TBD)	NRC
Personnel & Workplace	Radiation Control Areas	Personnel: Continuous, quarterly sampling Bioassay Workplace: throughout buildings	Radon-222, direct gamma Unat Radioparticulates, Radon-222 & daughters, Beta/gamma radiation	NRC

Appendix 3-A
Air Quality Monitoring Data

Table 1
Quarterly Passive Air Quality Radon Results[1]

Passive Monitoring Station ID	Start Date	End (seal) Date	Result (pCi-days/L)	Precision (pCi-days/L)	Avg. Radon Concentration (pCi/L)	Precision (pCi/L)
			2010 Q3			
AM-1	6/29/2010	9/30/2010	54.6	5.61	0.6	0.06
AM-2	6/29/2010	10/5/2010	48.7	5.16	0.5	0.05
AM-3	6/29/2010	10/5/2010	86.4	7.67	0.9	0.08
AM-4	6/29/2010	9/30/2010	108.3	8.9	1.2	0.10
AM-5	6/29/2010	9/30/2010	72.5	6.82	0.8	0.07
			2010 Q3			
AM-1	10/5/2010	1/4/2011	<30.0		<0.3	0.03
AM-2	10/5/2010	1/4/2011	36.8	3.85	0.4	0.04
AM-3	10/5/2010	1/4/2011	58.6	5.51	0.6	0.06
AM-4	9/30/2010	1/4/2011	88.4	7.39	0.9	0.08
AM-5	9/30/2010	1/4/2011	57.6	5.44	0.6	0.06
			2011 Q1			
AM-1	1/4/2011	4/3/2011	<30.0		<0.3	0.03
AM-2	1/4/2011	4/3/2011	<30.0		<0.3	0.03
AM-3	1/4/2011	4/3/2011	37.0	3.84	0.4	0.04
AM-4	1/4/2011	4/3/2011	<30.0		<0.3	0.03
AM-5	1/4/2011	4/3/2011	32.5	3.46	0.4	0.04
			2011 Q2			
AM-1	4/3/2011	7/5/2011	<30.0		<3.0	0.03
AM-2	4/3/2011	7/5/2011	51.6	5.19	0.6	0.06
AM-3	4/3/2011	7/5/2011	82.5	7.13	0.9	0.08
AM-4	4/3/2011	7/5/2011	88.7	7.47	1.0	0.08
AM-5	4/3/2011	7/5/2011	70.1	6.4	0.8	0.07
			2011 Q3			
AM-1	7/5/2011	9/27/2011	142.1	9.5	1.7	0.11
AM-2	7/5/2011	9/27/2011	<30.0		<0.3	0.03
AM-3	7/5/2011	9/27/2011	36.9	3.55	0.4	0.04
AM-4	7/5/2011	9/27/2011	63.7	5.44	0.8	0.06
AM-5	7/5/2011	9/27/2011	<30.0		<0.3	0.03
Claytor Ranch	6/20/2011	9/27/2011	120.4	8.5	1.2	0.09
AM-6	6/17/2011	9/27/2011	65.0	5.53	0.6	0.05

Passive Monitoring Station ID	Start Date	End (seal) Date	Result (pCi-days/L)	Precision (pCi-days/L)	Avg. Radon Concentration (pCi/L)	Precision (pCi/L)
AM-7	6/17/2011	9/27/2011	62.3	5.37	0.6	0.05
AM-8	6/17/2011	9/27/2011	148.3	9.7	1.5	0.10
AM-9	6/17/2011	9/27/2011	44.7	4.17	0.4	0.04
	2011 Q4					
AM-1	9/27/2011	1/5/2012	37.2	3.40	0.4	0.03
AM-2	9/27/2011	1/5/2012	31.9	2.99	0.3	0.03
AM-3	9/27/2011	1/5/2012	<30.0		<0.3	0.03
AM-4	9/27/2011	1/5/2012	<30.0		<0.3	0.03
AM-5	9/27/2011	1/5/2012	42.0	3.73	0.4	0.04
AM-6	9/27/2011	1/5/2012	<30.0		<0.3	0.03
AM-7	9/27/2011	1/5/2012	66.9	5.39	0.7	0.05
AM-8	9/27/2011	1/5/2012	75.3	5.89	0.8	0.06
AM-9	9/27/2011	1/5/2012	50.3	4.31	0.5	0.04
	2012 Q1					
AM-1	1/5/2012	3/28/2012	66.4	5.71	0.8	0.07
AM-2	1/5/2012	3/28/2012	51.7	4.74	0.6	0.06
AM-3	1/5/2012	3/28/2012	80.2	6.54	1.0	0.08
AM-4	1/5/2012	3/28/2012	58.1	5.18	0.7	0.06
AM-5	1/5/2012	3/28/2012	67.3	5.77	0.8	0.07
Claytor Ranch	1/5/2012	3/28/2012	251.8	13.5	2.9	0.15
AM-6	1/5/2012	3/28/2012	93.0	7.26	1.1	0.09
AM-7	1/5/2012	3/28/2012	51.0	4.54	0.6	0.05
AM-8	1/5/2012	3/28/2012	37.6	3.57	0.5	0.04
AM-9	1/5/2012	3/28/2012	68.0	5.64	0.8	0.07
	2012 Q2					
AM-1	3/28/2012	6/27/2012	53.3	4.57	0.6	0.05
AM-2	3/28/2012	6/27/2012	<30.0		<0.3	0.03
AM-3	3/28/2012	6/27/2012	59.6	4.98	0.7	0.05
AM-4	3/28/2012	6/27/2012	51.5	4.45	0.6	0.05
AM-5	3/28/2012	6/27/2012	45.3	4.02	0.5	0.04
Claytor Ranch	3/28/2012	6/27/2012	185.7	11.4	2.0	0.13
AM-6	3/28/2012	6/27/2012	31.0	2.94	0.3	0.03
AM-7	3/28/2012	6/27/2012	50.6	4.39	0.6	0.05
AM-8	3/28/2012	6/27/2012	115.1	8.0	1.3	0.09
AM-9	3/28/2012	6/27/2012	41.7	3.76	0.5	0.04

Passive Monitoring Station ID	Start Date	End (seal) Date	Result (pCi-days/L)	Precision (pCi-days/L)	Avg. Radon Concentration (pCi/L)	Precision (pCi/L)
	2012 Q3					
AM-1	6/27/2012	10/2/2012	43.2	3.96	0.4	0.04
AM-2	6/27/2012	10/2/2012	62.4	5.27	0.6	0.05
AM-3	6/27/2012	10/2/2012	131.3	9.0	1.4	0.09
AM-4	6/27/2012	10/2/2012	97.3	7.29	1.0	0.08
AM-5	6/27/2012	10/2/2012	72.5	5.90	0.7	0.06
Claytor Ranch	6/27/2012	10/2/2012	125.3	9.4	1.3	0.10
AM-6	6/27/2012	10/2/2012	112.9	8.1	1.2	0.08
AM-7	6/27/2012	10/2/2012	125.8	8.7	1.3	0.09
AM-8	6/27/2012	10/2/2012	263.7	13.9	2.7	0.14
AM-9	6/27/2012	10/2/2012	126.7	8.7	1.3	0.09
	2012 Q4					
AM-1	10/2/2012	1/3/2013	67.1	6.68	0.7	0.07
AM-2	10/2/2012	1/3/2013	59.4	6.16	0.6	0.07
AM-3	10/2/2012	1/3/2013	61.3	6.29	0.7	0.07
AM-4	10/2/2012	1/3/2013	93.4	8.26	1.0	0.09
AM-5	10/2/2012	1/3/2013	95.3	8.36	1.0	0.09
Claytor Ranch	10/2/2012	1/3/2013	255.5	14.5	2.7	0.16
AM-6	10/2/2012	1/3/2013	96.3	8.42	1.0	0.09
AM-7	10/2/2012	1/3/2013	89.4	8.03	1.0	0.09
AM-8	10/2/2012	1/3/2013	126.7	10.0	1.4	0.11
AM-9	10/2/2012	1/3/2013	100.2	8.6	1.1	0.09
AM-10	10/2/2012	1/3/2013	<30.0		<0.3	0.03
	2013 Q1					
AM-1	1/3/2013	3/28/2013	79.2	7.12	0.9	0.08
AM-2	1/3/2013	3/28/2013	78.3	7.06	0.9	78.3
AM-3	1/3/2013	3/28/2013	95.6	8.05	1.1	8.05
AM-4	1/3/2013	3/28/2013	62.9	6.08	0.7	0.07
AM-5	1/3/2013	3/28/2013	116.8	9.2	1.4	.11
Claytor Ranch	1/3/2013	4/3/2013	214.7	13.2	2.4	0.15
AM-6	1/3/2013	3/28/2013	76.3	6.94	0.9	0.08
AM-7	1/3/2013	3/28/2013	97.5	8.16	1.2	0.10
AM-8	1/3/2013	3/28/2013	118.8	9.2	1.4	0.11
AM-9	1/3/2013	3/28/2013	66.5	6.31	0.8	0.08
AM-10	1/3/2013	3/28/2013	56.8	5.65	0.7	0.07

Passive Monitoring Station ID	Start Date	End (seal) Date	Result (pCi-days/L)	Precision (pCi-days/L)	Avg. Radon Concentration (pCi/L)	Precision (pCi/L)
	2013 Q2					
AM-1	3/28/2013	6/26/2013	48.3	4.72	0.5	0.05
AM-2	3/28/2013	6/26/2013	<30.0		<0.3	0.03
AM-3	3/28/2013	6/26/2013	141.4	10.0	1.6	0.11
AM-4	3/28/2013	6/26/2013	<30.0		<0.3	0.03
AM-5	3/28/2013	6/26/2013	<30.0		<0.3	0.03
Claytor Ranch	4/2/2013	6/26/2013	197.9	12.5	2.3	0.15
AM-6	3/28/2013	6/26/2013	<30.0		<0.3	0.03
AM-7	3/28/2013	6/26/2013	<30.0		<0.3	0.03
AM-8	3/28/2013	6/26/2013	188.7	12.0	2.1	0.13
AM-9	3/28/2013	6/26/2013	114.9	8.7	1.3	0.10
AM-10	3/28/2013	6/26/2013	<30.0		<0.3	0.03

Table 2
Summary of Quarterly Passive Air Quality Radon Concentrations[1]

Passive Monitoring Station ID	Radon Concentrations (pCi/L)		
	Minimum	Maximum	Average
AM-1	<0.30	1.70	0.66
AM-2	<0.30	0.90	0.56
AM-3	0.40	1.60	0.88
AM-4	<0.30	1.20	0.79
AM-5	<0.30	1.40	0.67
Claytor Ranch	1.20	2.90	2.11
AM-6	<0.30	1.20	0.85
AM-7	0.60	1.30	0.86
AM-8	0.50	2.70	1.46
AM-9	0.40	1.30	0.84
AM-10	0.70	0.70	0.70

Table 3
Passive Air Monitoring Station Gamma Results

Passive Monitoring Station ID	OSL Issue Date	Field Installation Date	Monitoring End Date	Processed Date	Landauer's GROSS Result (mrems)	Estimated Dose During Monitoring Period (mrem)	Estimated Daily Field Dose (mrem)	Estimated Field Dose Rate (mrem/hour)
3rd Quarter 2010								
AM-1	6/17/2010	7/1/2010	10/5/2010	10/26/2010	44.2	34.6	0.360	0.015
AM-2	6/17/2010	7/1/2010	10/5/2010	10/26/2010	86.5	76.9	0.801	0.033
AM-3	6/17/2010	7/1/2010	10/5/2010	10/26/2010	214.2	204.6	2.131	0.089
AM-4	6/17/2010	7/1/2010	9/30/2010	10/26/2010	76.7	65.7	0.722	0.030
AM-5	6/17/2010	7/1/2010	9/30/2010	10/26/2010	60.2	49.2	0.540	0.023
Deploy Control	6/17/2010			10/26/2010	66.2			
Transit control	6/17/2010			10/26/2010	36.1			
4th Quarter 2010								
AM-1	9/7/2010	10/1/2010	1/4/2011	1/26/2011	45.9	34.3	0.361	0.015
AM-2	9/7/2010	10/1/2010	1/4/2011	1/26/2011	85.9	74.3	0.782	0.033
AM-3	9/7/2010	10/1/2010	1/4/2011	1/26/2011	184.8	173.2	1.823	0.076
AM-4	9/7/2010	10/1/2010	1/4/2011	1/26/2011	60.1	48.5	0.510	0.021
AM-5	9/7/2010	10/1/2010	1/4/2011	1/26/2011	58.6	47.0	0.494	0.021
Deploy Control	9/7/2010			1/26/2011	56.8			
Transit control	9/7/2010			1/26/2011	35.7			
1st Quarter 2011								
AM-1	12/06/2010	1/4/2011	4/3/2011	4/14/2011	35.6	24.6	0.276	0.011
AM-2	12/06/2010	1/4/2011	4/3/2011	4/14/2011	64.8	53.8	0.604	0.025
AM-3	12/06/2010	1/4/2011	4/3/2011	4/14/2011	178.4	167.4	1.880	0.078
AM-4	12/06/2010	1/4/2011	4/3/2011	4/14/2011	64.7	53.7	0.603	0.025
AM-5	12/06/2010	1/4/2011	4/3/2011	4/14/2011	50.0	39.0	0.438	0.018
Deploy Control	12/06/2010			4/14/2011	59.2			
Transit control	12/06/2010			4/14/2011	35.6			
2nd Quarter 2011								
AM-1	3/07/2011	4/3/2011	7/5/2011	10/19/2011	45.9	NC		
AM-2	3/07/2011	4/3/2011	7/5/2011	10/19/2011	81.8	NC		

Passive Monitoring Station ID	OSL Issue Date	Field Installation Date	Monitoring End Date	Processed Date	Landauer's GROSS Result (mrems)	Estimated Dose During Monitoring Period (mrem)	Estimated Daily Field Dose (mrem)	Estimated Field Dose Rate (mrem/hour)
AM-3	3/07/2011	4/3/2011	7/5/2011	10/19/2011	203.5	NC		
AM-4	3/07/2011	4/3/2011	7/5/2011	10/19/2011	83.7	NC		
AM-5	3/07/2011	4/3/2011	7/5/2011	10/19/2011	60.0	NC		
3rd Quarter 2011								
AM-1	06/06/2011	7/5/2011	9/27/2011	10/19/2011	41.9	29.1	0.346	0.014
AM-2	06/06/2011	7/5/2011	9/27/2011	10/19/2011	81.9	69.1	0.823	0.034
AM-3	06/06/2011	7/5/2011	9/27/2011	10/19/2011	217.1	204.3	2.432	0.101
AM-4	06/06/2011	7/5/2011	9/27/2011	10/19/2011	77.1	64.3	0.765	0.032
AM-5	06/06/2011	7/5/2011	9/27/2011	10/19/2011	59.0	46.2	0.550	0.023
Deploy Control	06/06/2011			10/19/2011	32.6			
Transit control	06/06/2011			10/19/2011	33.9			
4th Quarter 2011								
AM-1	9/6/2011	9/27/2011	1/1/2012	2/2/2012	46.6	33.0	0.344	0.014
AM-2	9/6/2011	9/27/2011	1/1/2012	2/2/2012	80.7	67.1	0.699	0.029
AM-3	9/6/2011	9/27/2011	1/1/2012	2/2/2012	228.8	215.2	2.242	0.093
AM-4	9/6/2011	9/27/2011	1/1/2012	2/2/2012	77.7	64.1	0.668	0.028
AM-5	9/6/2011	9/27/2011	1/1/2012	2/2/2012	62.2	48.6	0.507	0.021
Deploy Control	9/6/2011			2/2/2012	36.5			
Transit control	9/6/2011			2/2/2012	38.1			
1st Quarter 2012								
AM-1	12/29/2011	1/1/2012	3/28/2012	4/18/2012	30.6	24.5	0.282	0.012
AM-2	12/29/2011							
AM-3	12/29/2011	1/1/2012	3/28/2012	4/18/2012	184.6	178.5	2.052	0.086
AM-4	12/29/2011	1/1/2012	3/28/2012	4/18/2012	58.4	52.3	0.602	0.025
AM-5	12/29/2011	1/1/2012	3/28/2012	4/18/2012	43.7	37.6	0.433	0.018
AM-6	12/29/2011	1/1/2012	3/28/2012	4/18/2012	47.8	41.7	0.480	0.020
AM-7	12/29/2011	1/1/2012	3/28/2012	4/18/2012	48.6	42.5	0.489	0.020
AM-8	12/29/2011							
AM-9	12/29/2011	1/1/2012	3/28/2012	4/18/2012	46.1	40.0	0.460	0.019
AM-10	12/29/2011	1/1/2012	3/28/2012	4/18/2012	64.4	58.3	0.671	0.028
Deploy	12/29/2011			4/18/2012	29.2			

Passive Monitoring Station ID	OSL Issue Date	Field Installation Date	Monitoring End Date	Processed Date	Landauer's GROSS Result (mrems)	Estimated Dose During Monitoring Period (mrem)	Estimated Daily Field Dose (mrem)	Estimated Field Dose Rate (mrem/hour)
Control								
Transit control	12/29/2011			4/18/2012	28			
2nd Quarter 2012								
AM-1	03/05/2012	3/28/2012	6/27/2012	7/26/2012	44.6	30.3	0.333	0.014
AM-2	03/05/2012	3/28/2012	6/27/2012	7/26/2012	81.8	67.5	0.741	0.031
AM-3	03/05/2012	3/28/2012	6/27/2012	7/26/2012	258.2	243.9	2.680	0.112
AM-4	03/05/2012	3/28/2012	6/27/2012	7/26/2012	80.9	66.6	0.732	0.030
AM-5	03/05/2012	3/28/2012	6/27/2012	7/26/2012	61.9	47.6	0.523	0.022
AM-6	03/05/2012	3/28/2012	6/27/2012	7/26/2012	66.3	52.0	0.571	0.024
AM-7	03/05/2012	3/28/2012	6/27/2012	7/26/2012	85.8	71.5	0.785	0.033
AM-8	03/05/2012	3/28/2012	6/27/2012	7/26/2012	271.3	257.0	2.824	0.118
AM-9	03/05/2012	3/28/2012	6/27/2012	7/26/2012	64	49.7	0.546	0.023
AM-10	03/05/2012	3/28/2012	6/27/2012	7/26/2012	45.7	31.4	0.345	0.014
Deploy Control	03/05/2012			7/26/2012	39.4			
3rd Quarter 2012								
AM-1	06/06/2012	6/27/2012	10/3/2012	10/09/2012	41.2	34.4	0.351	0.015
AM-2	06/06/2012	6/27/2012	10/3/2012	10/09/2012	84.6	77.8	0.794	0.033
AM-3	06/06/2012	6/27/2012	10/3/2012	10/09/2012	245.8	239.0	2.439	0.102
AM-4	06/06/2012	6/27/2012	10/3/2012	10/09/2012	83.6	76.8	0.784	0.033
AM-5	06/06/2012	6/27/2012	10/3/2012	10/09/2012	60.1	53.3	0.544	0.023
AM-6	06/06/2012	6/27/2012	10/3/2012	10/09/2012	60.9	54.1	0.552	0.023
AM-7	06/06/2012	6/27/2012	10/3/2012	10/09/2012	83.6	76.8	0.784	0.033
AM-8	06/06/2012	6/27/2012	10/3/2012	10/09/2012	306.2	299.4	3.055	0.127
AM-9	06/06/2012	6/27/2012	10/3/2012	10/09/2012	61.9	55.1	0.562	0.023
AM-10	06/06/2012	6/27/2012	10/3/2012	10/09/2012	34.9	28.1	0.287	0.012
Control Dose	06/06/2012			10/09/2012	31.5			
4th Quarter 2012								
AM-1	9/7/2014	10/3/2012	1/3/2013	1/09/2013	43.3	34.6	0.376	0.016
AM-2	9/7/2014	10/3/2012	1/3/2013	1/09/2013	79.6	70.9	0.770	0.032
AM-3	9/7/2014	10/3/2012	1/3/2013	1/09/2013	216.9	208.2	2.263	0.094
AM-4	9/7/2014	10/3/2012	1/3/2013	1/09/2013	79.6	70.9	0.770	0.032
AM-5	9/7/2014	10/3/2012	1/3/2013	1/09/2013	58.8	50.1	0.544	0.023

Passive Monitoring Station ID	OSL Issue Date	Field Installation Date	Monitoring End Date	Processed Date	Landauer's GROSS Result (mrems)	Estimated Dose During Monitoring Period (mrem)	Estimated Daily Field Dose (mrem)	Estimated Field Dose Rate (mrem/hour)
AM-6	9/7/2014	10/3/2012	1/3/2013	1/09/2013	78.7	70.0	0.760	0.032
AM-7	9/7/2014	10/3/2012	1/3/2013	1/09/2013	78.7	70.0	0.760	0.032
AM-8	9/7/2014	10/3/2012	1/3/2013	1/09/2013	279.8	271.1	2.946	0.123
AM-9	9/7/2014	10/3/2012	1/3/2013	1/09/2013	61	52.3	0.568	0.024
AM-10	9/7/2014	10/3/2012	1/3/2013	1/09/2013	67.6	58.9	0.640	0.027
Control Dose	9/7/2014			1/09/2013	33.9			
1st Quarter 2013								
AM-1	12/17/2012	1/3/2013	3/28/2013	04/09/2013	38	28.7	0.341	0.014
AM-2	12/17/2012	1/3/2013	3/28/2013	04/09/2013	76.4	67.1	0.798	0.033
AM-3	12/17/2012	1/3/2013	3/28/2013	04/09/2013	213.6	204.3	2.432	0.101
AM-4	12/17/2012	1/3/2013	3/28/2013	04/09/2013	73.7	64.4	0.766	0.032
AM-5	12/17/2012	1/3/2013	3/28/2013	04/09/2013	51.5	42.2	0.502	0.021
AM-6	12/17/2012	1/3/2013	3/28/2013	04/09/2013	51.6	42.3	0.503	0.021
AM-7	12/17/2012	1/3/2013	3/28/2013	04/09/2013	71.6	62.3	0.741	0.031
AM-8	12/17/2012	1/3/2013	3/28/2013	04/09/2013	285.7	276.4	3.290	0.137
AM-9	12/17/2012	1/3/2013	3/28/2013	04/09/2013	57.9	48.6	0.578	0.024
AM-10	12/17/2012	1/3/2013	3/28/2013	04/09/2013	65.1	55.8	0.664	0.028
Control Dose	12/17/2012			04/09/2013	36.4			
2nd Quarter 2013								
AM-1	3/13/2013	4/1/2013	6/30/2013	7/2/2013	37.9	31.5	0.350	0.015
AM-2	3/13/2013	4/1/2013	6/30/2013	7/2/2013	77.3	70.9	0.788	0.033
AM-3	3/13/2013	4/1/2013	6/30/2013	7/2/2013	206.2	199.8	2.220	0.093
AM-4	3/13/2013	4/1/2013	6/30/2013	7/2/2013	74.7	68.3	0.759	0.032
AM-5	3/13/2013	4/1/2013	6/30/2013	7/2/2013	55.2	48.8	0.542	0.023
AM-6	3/13/2013	4/1/2013	6/30/2013	7/2/2013	58.6	52.2	0.580	0.024
AM-7	3/13/2013	4/1/2013	6/30/2013	7/2/2013	75.5	69.1	0.768	0.032
AM-8	3/13/2013	4/1/2013	6/30/2013	7/2/2013	281.1	274.7	3.052	0.127
AM-9	3/13/2013	4/1/2013	6/30/2013	7/2/2013	56.9	50.5	0.561	0.023
AM-10	3/13/2013	4/1/2013	6/30/2013	7/2/2013	67.7	61.3	0.681	0.028
Control Dose	3/13/2013			7/2/2013	33.8			

NC – arrived without control values not calculated

Table 4
Summary of Gamma Data

Station ID	Field Dose Rate (mrem/hr)			Average Dose Rate (mrem/yr)
	Minimum	Maximum	Average	
AM-1	0.011	0.016	0.014	123.44
AM-2	0.025	0.034	0.032	276.82
AM-3	0.076	0.112	0.093	816.27
AM-4	0.021	0.033	0.029	254.84
AM-5	0.000	0.023	0.020	172.28
AM-6	0.020	0.032	0.024	210.24
AM-7	0.020	0.033	0.030	264.26
AM-8	0.118	0.137	0.126	1107.26
AM-9	0.019	0.024	0.023	198.56
AM-10	0.012	0.028	0.023	200.02

Table 5
Air Particulate Monitoring: Third Quarter 2010

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM-1	9/1/2010	2,602,044	Pb-210	25.4	3.7	2	9.8E-15	1.4E-15	2.0E-15
		2,602,044	Ra-226	3.25	1.5	0.1	1.2E-15	5.8E-16	1.0E-16
		2,602,044	Th-230	0.92	1.2	0.1	3.5E-16	4.6E-16	1.0E-16
		2,602,044	U-Nat	0.4	n/a	0.1	1.5E-16	n/a	1.0E-16
AM-2	9/1/2010	4,930,533	Pb-210	26.7	3.7	2	5.4E-15	7.5E-16	2.0E-15
		4,930,533	Ra-226	7.03	2.0	0.1	1.4E-15	4.1E-16	1.0E-16
		4,930,533	Th-230	3.44	2.4	0.1	7.0E-16	4.9E-16	1.0E-16
		4,930,533	U-Nat	2.0	n/a	0.1	4.1E-16	n/a	1.0E-16
AM-3	9/1/2010	3,891,630	Pb-210	17.8	3.2	2	4.6E-15	8.2E-16	2.0E-15
		3,891,630	Ra-226	3.32	1.5	0.1	8.5E-16	3.9E-16	1.0E-16
		3,891,630	Th-230	2.95	2.4	0.1	7.6E-16	6.2E-16	1.0E-16
		3,891,630	U-Nat	0.2	n/a	0.1	<1.0E-16	n/a	1.0E-16
AM-4	10/7/2010	2,241,652	Pb-210	37.6	0.9	1	1.7E-14	4.0E-16	2.0E-15
		2,241,652	Ra-226	0.4	0.2	0.2	1.8E-16	8.9E-17	1.0E-16
		2,241,652	Th-230	0.6	0.4	0.2	2.7E-16	1.8E-16	1.0E-16
		2,241,652	U-Nat	0.98	n/a	0.01	4.4E-16	n/a	1.0E-16
AM-5	9/1/2010	3,900,782	Pb-210	26.1	3.7	2	6.7E-15	9.5E-16	2.0E-15
		3,900,782	Ra-226	9.71	4.5	0.1	2.5E-15	1.2E-15	1.0E-16
		3,900,782	Th-230	2.04	1.8	0.1	5.2E-16	4.6E-16	1.0E-16
		3,900,782	U-Nat	0.2	n/a	0.1	<1.0E-16	n/a	1.0E-16

[1] Concentration is from lab calculated value.

Table 6
Air Particulate Monitoring: Fourth Quarter 2010

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	1/4/2011	3,687,000	Pb-210	63.0	5.0	2	1.7E-14	1.4E-15	2.0E-15
		3,687,000	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		3,687,000	Th-230	<0.3		0.3	<1.0E-16		1.0E-16
		3,687,000	U-Nat	0.4		0.1	1.1E-16		1.0E-16
AM2	1/4/2011	3,965,000	Pb-210	76.6	5.3	2	1.9E-14	1.3E-15	2.0E-15
		3,965,000	Ra-226	0.8	0.4	0.3	2.0E-16	1.0E-16	1.0E-16
		3,965,000	Th-230	0.6	0.4	0.3	1.5E-16	1.0E-16	1.0E-16
		3,965,000	U-Nat	1.0		0.1	2.5E-16		1.0E-16
AM3	1/4/2011	3,797,000	Pb-210	69.7	5.1	2	1.8E-14	1.3E-15	2.0E-15
		3,797,000	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		3,797,000	Th-230	<0.3		0.3	<1.0E-16		1.0E-16
		3,797,000	U-Nat	1.0		0.1	2.6E-16		1.0E-16
AM4	1/4/2011	3,446,400	Pb-210	71.5	5.2	2	2.1E-14	1.5E-15	2.0E-15
		3,446,400	Ra-226	1.0	0.4	0.3	2.9E-16	1.2E-16	1.0E-16
		3,446,400	Th-230	0.5	0.3	0.3	1.5E-16	8.7E-17	1.0E-16
		3,446,400	U-Nat	1.1		0.1	3.2E-16		1.0E-16
AM5	1/4/2011	3,900,782	Pb-210	78.5	5.7	2	2.0E-14	1.5E-15	2.0E-15
		3,900,782	Ra-226	0.5	0.3	0.3	1.3E-16	7.7E-17	1.0E-16
		3,900,782	Th-230	<0.3		0.3	<1.0E-16		1.0E-16
		3,900,782	U-Nat	0.6		0.1	1.5E-16		1.0E-16

[1] Concentration is from lab calculated values

Table 7
Air Particulate Monitoring: First Quarter 2011

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	3/31/2011	3,349,100	Pb-210	44.8	4.4	2	1.3E-14	1.3E-15	2.0E-15
		3,349,100	Ra-226	0.4	0.1	0.3	1.2E-16	3.0E-17	1.0E-16
		3,349,100	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		3,349,100	U-Nat	0.4		0.3	1.1E-16		1.0E-16
AM2	3/31/2011	3,522,800	Pb-210	59.3	6.6	2	1.7E-14	1.9E-15	2.0E-15
		3,522,800	Ra-226	0.7	0.2	0.3	2.0E-16	5.7E-17	1.0E-16
		3,522,800	Th-230	0.6	0.3	0.2	1.7E-16	8.5E-17	1.0E-16
		3,522,800	U-Nat	1.0		0.3	2.8E-16		1.0E-16
AM3	3/31/2011	3,359,000	Pb-210	47.2	5.5	2	1.4E-14	1.6E-15	2.0E-15
		3,359,000	Ra-226	0.4	0.1	0.3	1.2E-16	3.0E-17	1.0E-16
		3,359,000	Th-230	0.2	0.2	0.2	<1.0E-16	3.0E-17	1.0E-16
		3,359,000	U-Nat	0.5		0.3	1.6E-16		1.0E-16
AM4	3/31/2011	3,230,000	Pb-210	58.4	5.2	2	1.8E-14	1.6E-15	2.0E-15
		3,230,000	Ra-226	<1.2		1.2	2.1E-16	9.3E-17	2.1E-16
		3,230,000	Th-230	0.4	0.2	0.2	1.2E-16	6.2E-17	1.0E-16
		3,230,000	U-Nat	1.0		0.3	3.2E-16		1.0E-16
AM5	3/31/2011	3,125,721	Pb-210	52.4	4.9	2	1.7E-14	1.6E-15	2.0E-15
		3,125,721	Ra-226	0.4	0.1	0.3	1.3E-16	3.2E-17	1.0E-16
		3,125,721	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		3,125,721	U-Nat	0.4		0.3	1.3E-16		1.0E-16

Table 8
Air Particulate Monitoring: Second Quarter 2011[1]

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	6/27/2011	4,175,300	Pb-210	39.0	3.4	3	9.4E-15	8.1E-16	2.0E-15
		4,175,300	Ra-226	0.3	0.1	0.3	<1.0E-16		1.0E-16
		4,175,300	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,175,300	U-Nat	0.3		0.3	<1.0E-16		1.0E-16
AM2	6/27/2011	3,660,900	Pb-210	34.7	3.2	3	9.5E-15	8.7E-16	2.0E-15
		3,660,900	Ra-226	0.5	0.1	0.3	1.4E-16	2.7E-17	1.0E-16
		3,660,900	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		3,660,900	U-Nat	0.6		0.3	1.5E-16		1.0E-16
AM3	6/27/2011	2,635,740	Pb-210	31.5	3.8	3	1.2E-14	1.4E-15	2.0E-15
		2,635,740	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		2,635,740	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
		2,635,740	U-Nat	0.4		0.3	1.4E-16		1.0E-16
AM4	6/27/2011	3,470,300	Pb-210	29.9	3.0	2	8.6E-15	8.6E-16	2.0E-15
		3,470,300	Ra-226	0.5	0.1	0.3	1.5E-16	2.9E-17	2.1E-16
		3,470,300	Th-230	0.5	0.3	0.2	1.6E-16	8.6E-17	1.0E-16
		3,470,300	U-Nat	0.7		0.3	2.0E-16		1.0E-16
AM5	6/27/2011	3,788,500	Pb-210	32.2	3.1	3	8.5E-15	8.2E-16	2.0E-15
		3,788,500	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		3,788,500	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		3,788,500	U-Nat	<0.3		0.3	<1.0E-16		1.0E-16

Table 9
Air Particulate Monitoring: Third Quarter 2011

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	9/27/2011	5,344,124	Pb-210	57.9	4.6	3	1.1E-14	8.6E-16	2.0E-15
		5,344,124	Ra-226	0.5	0.1	0.3	<1.0E-16		1.0E-16
		5,344,124	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		5,344,124	U-Nat	0.5		0.3	<1.0E-16		1.0E-16
AM2	9/27/2011	4,697,676	Pb-210	46.7	4.1	3	9.9E-15	8.7E-16	2.0E-15
		4,697,676	Ra-226	0.7	0.2	0.3	1.4E-16	4.3E-17	1.0E-16
		4,697,676	Th-230	0.5	0.3	0.2	1.2E-16	6.4E-17	1.0E-16
		4,697,676	U-Nat	0.9		0.3	1.8E-16		1.0E-16
AM3	9/27/2011	3,738,675	Pb-210	53.7	5.2	3	1.4E-14	1.4E-15	2.0E-15
		3,738,675	Ra-226	0.6	0.1	0.3	1.5E-16	2.7E-17	1.0E-16
		3,738,675	Th-230	0.4	0.2	0.2	1.0E-16	5.3E-17	1.0E-16
		3,738,675	U-Nat	0.9		0.3	2.3E-16		1.0E-16
AM4	9/27/2011	4,597,006	Pb-210	69.3	4.9	3	1.5E-14	1.1E-15	2.0E-15
		4,597,006	Ra-226	1.1	0.2	0.3	2.3E-16	4.4E-17	1.0E-16
		4,597,006	Th-230	1.1	0.4	0.2	2.4E-16	8.7E-17	1.0E-16
		4,597,006	U-Nat	2.2		0.3	4.8E-16		1.0E-16
AM5	9/27/2011	4,885,130	Pb-210	60.2	4.6	3	1.2E-14	9.4E-16	2.0E-15
		4,885,130	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		4,885,130	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
		4,885,130	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM6	9/27/2011	6,093,170	Pb-210	52.8	4.3	2	8.7E-15	7.1E-16	2.0E-15
		6,093,170	Ra-226	0.5	0.1	0.3	<1.0E-16		1.0E-16
		6,093,170	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		6,093,170	U-Nat	1.1		0.3	1.8E-16		1.0E-16
AM7	9/27/2011	5,345,795	Pb-210	62.5	5.7	4	1.2E-14	1.1E-15	2.0E-15
		5,345,795	Ra-226	0.5	0.1	0.3	<1.0E-16		1.0E-16
		5,345,795	Th-230	1.1	0.5	0.2	2.1E-16	9.4E-17	1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		5,345,795	U-Nat	0.5		0.3	<1.0E-16		1.0E-16
AM8	9/27/2011	6,078,899	Pb-210	81.4	5.4	3	1.3E-14	8.9E-16	2.0E-15
		6,078,899	Ra-226	1.0	0.2	0.3	1.6E-16	3.3E-17	1.0E-16
		6,078,899	Th-230	0.7	0.3	0.2	1.2E-16	4.9E-17	1.0E-16
		6,078,899	U-Nat	1.7		0.3	2.8E-16		1.0E-16
AM9	9/27/2011	5,320,210	Pb-210	61.5	5.0	3	1.2E-14	9.4E-16	2.0E-15
		5,320,210	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		5,320,210	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		5,320,210	U-Nat	0.9		0.3	1.7E-16		1.0E-16

Table 10
Air Particulate Monitoring: Fourth Quarter 2011

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	12/27/2011	4,887,468	Pb-210	81.6	6.4	2	1.7E-14	1.3E-15	2.0E-15
AM1	12/27/2011	4,887,468	Ra-226	1.3	0.3	0.3	2.7E-16	6.1E-17	1.0E-16
AM1	12/27/2011	4,887,468	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
AM1	12/27/2011	4,887,468	U-Nat	0.9		0.3	1.9E-16		1.0E-16
AM2	12/27/2011	4,395,618	Pb-210	83.3	6.5	2	1.9E-14	1.5E-15	2.0E-15
AM2	12/27/2011	4,395,618	Ra-226	1.3	0.3	0.3	2.8E-16	6.8E-17	1.0E-16
AM2	12/27/2011	4,395,618	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
AM2	12/27/2011	4,395,618	U-Nat	1.2		0.3	2.8E-16		1.0E-16
AM3	12/27/2011	4,655,631	Pb-210	73.9	6.0	2	1.6E-14	1.3E-15	2.0E-15
AM3	12/27/2011	4,655,631	Ra-226	3.3	0.4	0.3	7.0E-16	8.6E-17	1.0E-16
AM3	12/27/2011	4,655,631	Th-230	1.7	0.5	0.2	3.6E-16	1.1E-16	1.0E-16
AM3	12/27/2011	4,655,631	U-Nat	4.1		0.3	8.9E-16		1.0E-16
AM4	12/27/2011	4,174,006	Pb-210	63.5	5.0	2	1.5E-14	1.2E-15	2.0E-15
AM4	12/27/2011	4,174,006	Ra-226	1.6	0.3	0.3	3.7E-16	7.2E-17	1.0E-16
AM4	12/27/2011	4,174,006	Th-230	0.4	0.2	0.2	1.1E-16	4.8E17	1.0E-16
AM4	12/27/2011	4,174,006	U-Nat	1.6		0.3	3.9E-16		1.0E-16
AM5	12/27/2011	4,969,383	Pb-210	84.4	6.4	2	1.7E-14	1.3E-15	2.0E-15
AM5	12/27/2011	4,969,383	Ra-226	0.9	0.2	0.3	1.9E-16	4.0E-17	1.0E-16
AM5	12/27/2011	4,969,383	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
AM5	12/27/2011	4,969,383	U-Nat	0.8		0.3	1.7E-16		1.0E-16
AM6	12/27/2011	4,421,457	Pb-210	77.0	6.0	2	1.7E-14	1.4E-15	2.0E-15
AM6	12/27/2011	4,421,457	Ra-226	1.2	0.3	0.3	2.7E-16	6.8E-17	1.0E-16
AM6	12/27/2011	4,421,457	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
AM6	12/27/2011	4,421,457	U-Nat	1.0		0.3	2.2E-16		1.0E-16
AM7	12/27/2011	4,612,712	Pb-210	63.1	5.6	2	1.4E-14	1.2E-15	2.0E-15
AM7	12/27/2011	4,612,712	Ra-226	1.2	0.2	0.3	2.5E-16	4.3E-17	1.0E-16
AM7	12/27/2011	4,612,712	Th-230	0.5	0.3	0.2	1.0E-16	6.5E-17	1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		4,612,712	U-Nat	1.0		0.3	2.1E-16		1.0E-16
AM8	12/27/2011	4,678,340	Pb-210	78.6	5.8	2	1.7E-14	1.2E-15	2.0E-15
		4,678,340	Ra-226	0.9	0.2	0.3	1.9E-16	4.3E-17	1.0E-16
		4,678,340	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,678,340	U-Nat	0.7		0.3	1.4E-16		1.0E-16
AM9	12/27/2011	5,236,768	Pb-210	83.0	6.4	2	1.6E-14	1.2E-15	2.0E-15
		5,236,768	Ra-226	1.3	0.3	0.3	2.4E-16	5.7E-17	1.0E-16
		5,236,768	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		5,236,768	U-Nat	0.9		0.3	1.8E-16		1.0E-16

Table 11
Air Particulate Monitoring: First Quarter 2012

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	3/28/12	4,828,496	Pb-210	90.9	7.0	2	1.9E-14	1.4E-15	2.0E-15
		4,828,496	Ra-226	0.7	0.2	0.3	1.4E-16	4.1E-17	1.0E-16
		4,828,496	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,828,496	U-Nat	0.8		0.3	1.7E-16		1.0E-16
AM2	3/28/12	4,518,610	Pb-210	55.4	4.9	2	1.2E-14	1.4E-15	2.0E-15
		4,518,610	Ra-226	1.0	0.2	0.3	2.2E-16	4.4E-17	1.0E-16
		4,518,610	Th-230	1.4	0.5	0.2	3.1E-16	1.1E-16	1.0E-16
		4,518,610	U-Nat	2.8		0.3	6.2E-16		1.0E-16
AM3	3/28/12	4,672,074	Pb-210	50.0	4.6	2	1.1E-14	9.8E-16	2.0E-15
		4,672,074	Ra-226	1.2	0.2	0.3	2.5E-16	4.3E-17	1.0E-16
		4,672,074	Th-230	0.6	0.3	0.2	1.3E-16	6.4E-17	1.0E-16
		4,672,074	U-Nat	2.3		0.3	4.9E-16		1.0E-16
AM4	3/28/12	4,187,307	Pb-210	61.3	5.0	2	1.5E-14	1.2E-15	2.0E-15
		4,187,307	Ra-226	2.5	0.3	0.3	5.9E-16	7.2E-17	1.0E-16
		4,187,307	Th-230	1.9	0.5	0.2	4.6E-16	1.2E-16	1.0E-16
		4,187,307	U-Nat	3.9		0.3	9.4E-16		1.0E-16
AM5	3/28/12	4,944,570	Pb-210	65.5	5.3	2	1.3E-14	1.1E-15	2.0E-15
		4,944,570	Ra-226	0.7	0.2	0.3	1.3E-16	4.0E-17	1.0E-16
		4,944,570	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		4,944,570	U-Nat	0.8		0.3	1.6E-16		1.0E-16
AM6	3/28/12	4,983,498	Pb-210	62.3	5.0	2	1.3E-14	1.0E-15	2.0E-15
		4,983,498	Ra-226	0.6	0.2	0.3	1.1E-16	4.0E-17	1.0E-16
		4,983,498	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,983,498	U-Nat	0.8		0.3	1.6E-16		1.0E-16
AM7	3/28/12	4,340,298	Pb-210	55.3	4.8	2	1.3E-14	1.1E-15	2.0E-15
		4,340,298	Ra-226	0.7	0.2	0.3	1.7E-16	4.6E-17	1.0E-16
		4,340,298	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		4,340,298	U-Nat	1.0		0.3	2.4E-16		1.0E-16
AM8	3/28/12	4,625,520	Pb-210	56.5	5.0	2	1.2E-14	1.1E-15	2.0E-15
		4,625,520	Ra-226	3.9	0.4	0.3	8.5E-16	8.6E-17	1.0E-16
		4,625,520	Th-230	3.5	0.7	0.2	7.6E-16	1.5E-16	1.0E-16
		4,625,520	U-Nat	5.2		0.3	1.1E-15		1.0E-16
AM9	3/28/12	4,743,659	Pb-210	63.4	5.1	2	1.3E-14	1.1E-15	2.0E-15
		4,743,659	Ra-226	0.5	0.1	0.3	1.2E-16	2.1E-17	1.0E-16
		4,743,659	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,743,659	U-Nat	0.7		0.3	1.5E-16		1.0E-16

Table 12
Air Particulate Monitoring: Second Quarter 2012

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	3/28/2012	4,234,024	Pb-210	51.6	5.7	2	1.2E-14	1.3E-15	2.0E-15
		4,234,024	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,234,024	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,234,024	U-Nat	0.5		0.3	1.2E-16		1.0E-16
AM2	3/28/2012	3,622,831	Pb-210	49.7	6.2	2	1.4E-14	1.7E-15	2.0E-15
		3,622,831	Ra-226	0.5	0.1	0.3	1.4E-16	2.8E-17	1.0E-16
		3,622,831	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
		3,622,831	U-Nat	0.5		0.3	1.3E-16		1.0E-16
AM3	3/28/2012	4,470,310	Pb-210	55.8	6.1	2	1.2E-14	1.4E-15	2.0E-15
		4,470,310	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,470,310	Th-230	0.2		0.2	<1.0E-16		1.0E-16
		4,470,310	U-Nat	0.7		0.3	1.5E-16		1.0E-16
AM4	3/28/2012	4,207,538	Pb-210	62.3	6.7	2	1.5E-14	1.6E-15	2.0E-15
		4,207,538	Ra-226	0.6	0.1	0.3	1.3E-16	2.4E-17	1.0E-16
		4,207,538	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,207,538	U-Nat	0.7		0.3	1.6E-16		1.0E-16
AM5	3/28/2012	4,809,229	Pb-210	53.6	5.8	2	1.1E-14	1.2E-15	2.0E-15
		4,809,229	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,809,229	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,809,229	U-Nat	0.3		0.3	<1.0E-16		1.0E-16
AM6	3/28/2012	4,772,075	Pb-210	48.5	5.0	2	1.0E-14	1.0E-15	2.0E-15
		4,772,075	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		4,772,075	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,772,075	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM7	3/28/2012	3,689,474	Pb-210	44.0	4.6	2	1.2E-14	1.2E-15	2.0E-15
		3,689,474	Ra-226	0.4	0.1	0.3	1.1E-16	2.7E-17	1.0E-16
		3,689,474	Th-230	<0.2		0.2	<1.0E-16		1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		3,689,474	U-Nat	0.4		0.3	1.1E-16		1.0E-16
AM8	3/28/2012	4,112,019	Pb-210	45.8	4.8	2	1.1E-14	1.2E-15	2.0E-15
		4,112,019	Ra-226	0.9	0.2	0.3	2.3E-16	4.9E-17	1.0E-16
		4,112,019	Th-230	1.3	1.3	0.2	3.1E-16	3.2E-16	1.0E-16
		4,112,019	U-Nat	1.2		0.3	3.0E-16		1.0E-16
AM9	3/28/2012	4,430,827	Pb-210	49.2	5.0	2	1.1E-14	1.1E-15	2.0E-15
		4,430,827	Ra-226	0.5	0.1	0.3	1.2E-16	2.3E-17	1.0E-16
		4,430,827	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,430,827	U-Nat	0.4		0.3	<1.0E-16		1.0E-16

Table 13
Air Particulate Monitoring: Third Quarter 2012

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	9/30/2012	4,317,282	Pb-210	79.9	5.8	2	1.8E-14	1.3E-15	2.0E-15
		4,317,282	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,317,282	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
		4,317,282	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM2	9/30/2012	4,291,002	Pb-210	69.6	6.3	2	1.6E-14	1.5E-15	2.0E-15
		4,291,002	Ra-226	0.3	0.1	0.3	<1.0E-16		1.0E-16
		4,291,002	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,291,002	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM3	9/30/2012	4,996,481	Pb-210	82.5	5.9	2	1.7E-14	1.2E-15	2.0E-15
		4,996,481	Ra-226	0.6	0.2	0.3	1.2E-16	4.0E-17	1.0E-16
		4,996,481	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,996,481	U-Nat	0.7		0.3	1.4E-16		1.0E-16
AM4	9/30/2012	4,964,002	Pb-210	73.3	5.7	2	1.5E-14	1.1E-15	2.0E-15
		4,964,002	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,964,002	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,964,002	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM5	9/30/2012	4,735,430	Pb-210	87.6	6.2	2	1.9E-14	1.3E-15	2.0E-15
		4,735,430	Ra-226	0.5	0.1	0.3	1.1E-16	2.1E-17	1.0E-16
		4,735,430	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,735,430	U-Nat	0.3		0.3	<1.0E-16		1.0E-16
AM6	9/30/2012	4,979,380	Pb-210	82.7	6.0	2	1.7E-14	1.2E-15	2.0E-15
		4,979,380	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,979,380	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,979,380	U-Nat	0.3		0.3	<1.0E-16		1.0E-16
AM7	9/30/2012	4,160,426	Pb-210	64.1	5.3	2	1.5E-14	1.3E-15	2.0E-15
		4,160,426	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,160,426	Th-230	<0.2		0.2	<1.0E-16		1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		4,160,426	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM8	9/30/2012	5,105,620	Pb-210	78.2	6.2	2	1.5E-14	1.2E-15	2.0E-15
		5,105,620	Ra-226	0.7	0.2	0.3	1.3E-16	3.9E-17	1.0E-16
		5,105,620	Th-230	0.4		0.2	<1.0E-16		1.0E-16
		5,105,620	U-Nat	0.8		0.3	1.6E-16		1.0E-16
AM9	9/30/2012	4,588,716	Pb-210	80.3	5.9	2	1.8E-14	1.3E-15	2.0E-15
		4,588,716	Ra-226	0.5	0.1	0.3	1.1E-16	2.2E-17	1.0E-16
		4,588,716	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,588,716	U-Nat	0.4		0.3	<1.0E-16		1.0E-16

Table 14
Air Particulate Monitoring: Fourth Quarter 2012

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	12/24/2012	3,993,919	Pb-210	59.5	5.8	2	1.5E-14	1.5E-15	2.0E-15
		3,993,919	Ra-226	<0.3		0.3	<1.0E-16		1.0E-16
		3,993,919	Th-230	0.2	0.1	0.2	<1.0E-16		1.0E-16
		3,993,919	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM2	12/24/2012	3,858,431	Pb-210	63.4	6.0	2	1.6E-14	1.6E-15	2.0E-15
		3,858,431	Ra-226	0.5	0.1	0.3	1.4E-16	2.6E-17	1.0E-16
		3,858,431	Th-230	<0.20		0.2	<1.0E-16		1.0E-16
		3,858,431	U-Nat	0.5		0.3	1.2E-16		1.0E-16
AM4	12/24/2012	4,511,349	Pb-210	56.9	5.6	2	1.3E-14	1.2E-15	2.0E-15
		4,511,349	Ra-226	1.0	0.2	0.3	2.2E-16	4.4E-17	1.0E-16
		4,511,349	Th-230	0.7	0.3	0.2	1.5E-16	6.6E-17	1.0E-16
		4,511,349	U-Nat	1.3		0.3	2.8E-16		1.0E-16
AM5	12/24/2012	4,387,349	Pb-210	69.5	6.6	2	1.6E-14	1.5E-15	2.0E-15
		4,387,349	Ra-226	0.5	0.1	0.3	1.1E-16	2.3E-17	1.0E-16
		4,387,349	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,387,349	U-Nat	0.5		0.3	1.1E-16		1.0E-16
AM6	12/24/2012	4,540,000	Pb-210	72.7	6.5	2	1.6E-14	1.4E-15	2.0E-15
		4,540,000	Ra-226	0.3	0.1	0.3	<1.0E-16		1.0E-16
		4,540,000	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,540,000	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM7	12/24/2012	3,951,045	Pb-210	54.7	6.0	2	1.4E-14	1.5E-15	2.0E-15
		3,951,045	Ra-226	0.4	0.1	0.3	1.0E-16	1.5E-15	1.0E-16
		3,951,045	Th-230	0.2	0.1	0.2	<1.0E-16		1.0E-16
		3,951,045	U-Nat	0.4		0.3	1.0E-16		1.0E-16
AM8	12/24/2012	4,585,199	Pb-210	66.6	6.4	2	1.5E-14	1.E-15	2.0E-15
		4,585,199	Ra-226	3.4	0.4	0.3	7.5E-16	8.7E-17	1.0E-16
		4,585,199	Th-230	2.4	0.5	0.2	5.2E-16	1.1E-16	1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		4,585,199	U-Nat	4.1		0.3	9.0E-16		1.0E-16
AM9	12/24/2012	4,163,513	Pb-210	64.8	6.7	2	1.6E-14	1.6E-15	2.0E-15
		4,163,513	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,163,513	Th-230	0.2	0.1	0.2	<1.0E-16		1.0E-16
		4,163,513	U-Nat	0.4		0.3	<1.0E-16		1.0E-16
AM10	12/24/2012	4,426,438	Pb-210	42.6	5.9	2	9.6E-15	1.3E-15	2.0E-15
		4,426,438	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,426,438	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		4,426,438	U-Nat	0.3		0.3	<1.0E-16		1.0E-16

Table 15
Air Particulate Monitoring: First Quarter 2013

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1	3/30/13	3,542,807	Pb-210	36.7	3.6	2	1.0E-14	1.0E-15	2.0E-15
		3,542,807	Ra-226	0.4	0.1	0.3	1.1E-16	2.8E-17	1.0E-16
		3,542,807	Th-230	0.5	0.4	0.2	1.5E-16	1.1E-16	1.0E-16
		3,542,807	U-Nat	0.6		0.3	1.6E-16		1.0E-16
AM2	3/30/13	4,071,122	Pb-210	34.9	3.4	2	8.6E-15	8.4E-16	2.0E-15
		4,071,122	Ra-226	0.6	0.1	0.3	1.4E-16	2.5E-17	1.0E-16
		4,071,122	Th-230	0.7	0.4	0.2	1.8E-16	9.8E-17	1.0E-16
		4,071,122	U-Nat	0.8		0.3	1.9E-16		1.0E-16
AM4	3/30/13	4,772,331	Pb-210	77.1	6.4	2	1.6E-14	1.3E-15	2.0E-15
		4,772,331	Ra-226	0.6	0.2	0.3	1.3E-16	4.2E-17	1.0E-16
		4,772,331	Th-230	0.8	0.4	0.2	1.6E-16	8.4E-17	1.0E-16
		4,772,331	U-Nat	0.7		0.3	1.5E-16		1.0E-16
AM5	3/30/13	4,573,126	Pb-210	72.4	6.1	2	1.6E-14	1.3E-15	2.0E-15
		4,573,126	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,573,126	Th-230	0.2	0.2	0.2	<1.0E-16		1.0E-16
		4,573,126	U-Nat	0.6		0.3	1.4E-16		1.0E-16
AM6	3/30/13	4,842,921	Pb-210	75.6	6.4	2	1.6E-14	1.3E-15	2.0E-15
		4,842,921	Ra-226	0.6	0.2	0.3	1.3E-16	4.1E-17	1.0E-16
		4,842,921	Th-230	0.5	0.3	0.2	<1.0E-16		1.0E-16
		4,842,921	U-Nat	0.7		0.3	1.5E-16		1.0E-16
AM7	3/30/13	4,492,199	Pb-210	65.2	6.0	2	1.5E-14	1.3E-15	2.0E-15
		4,492,199	Ra-226	0.6	0.2	0.3	1.4E-16	4.5E-17	1.0E-16
		4,492,199	Th-230	0.4	0.3	0.2	<1.0E-16		1.0E-16
		4,492,199	U-Nat	0.6		0.3	1.4E-16		1.0E-16
AM8	3/30/13	4,757,296	Pb-210	69.9	6.1	2	1.5E-14	1.3E-15	2.0E-15
		4,757,296	Ra-226	1.6	0.2	0.3	3.3E-16	4.2E-17	1.0E-16
		4,757,296	Th-230	2.4	0.7	0.2	4.9E-16	1.5E-16	1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		4,757,296	U-Nat	2.0		0.3	4.1E-16		1.0E-16
AM9	3/30/13	4,832,233	Pb-210	76.8	6.4	2	1.6E-14	1.3E-15	2.0E-15
		4,832,233	Ra-226	0.6	0.1	0.3	1.2E-16	2.1E-17	1.0E-16
		4,832,233	Th-230	0.4	0.3	0.2	<1.0E-16		1.0E-16
		4,832,233	U-Nat	0.7		0.3	1.4E-16		1.0E-16
AM10	3/30/13	4,960,729	Pb-210	78.5	6.4	2	1.6E-14	1.3E-15	2.0E-15
		4,960,729	Ra-226	0.4	0.1	0.3	<1.0E-16		1.0E-16
		4,960,729	Th-230	0.3	0.3	0.2	<1.0E-16		1.0E-16
		4,960,729	U-Nat	0.5		0.3	1.1E-16		1.0E-16

Table 16
Air Particulate Monitoring: Second Quarter 2013

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
AM1[1]	6/29/2013	2,681,836	Pb-210	33.5	3.8	2	1.2E-14	1.4E-15	2.0E-15
		2,681,836	Ra-226	0.4	0.1	0.3	1.6E-16	3.7E-17	1.0E-16
		2,681,836	Th-230	0.7	0.3	0.2	2.6E-16	1.1E-16	1.0E-16
		2,681,836	U-Nat	0.6		0.3	2.4E-16		1.0E-16
AM2	6/29/2013	3,842,959	Pb-210	40.0	4.1	2	1.0E-14	1.1E-15	2.0E-15
		3,842,959	Ra-226	0.3	0.1	0.3	<1.0E-16		1.0E-16
		3,842,959	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		3,842,959	U-Nat	0.8		0.3	2.0E-16		1.0E-16
AM4[1]	6/29/2013	2,980,824	Pb-210	31.8	3.8	2	1.1E-14	1.3E-15	2.0E-15
		2,980,824	Ra-226	0.5	0.1	0.3	1.6E-16	3.4E-17	1.0E-16
		2,980,824	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		2,980,824	U-Nat	0.5		0.3	1.6E-16		1.0E-16
AM5[1]	6/29/2013	2,055,968	Pb-210	25.1	3.3	2	1.2E-14	1.6E-15	2.0E-15
		2,055,968	Ra-226	0.8	0.2	0.3	4.0E-16	9.7E-17	1.0E-16
		2,055,968	Th-230	0.3	0.2	0.2	1.5E-16	9.7E-17	1.0E-16
		2,055,968	U-Nat	1.0		0.3	4.7E-16		1.0E-16
AM6	6/29/2013	4,040,705	Pb-210	42.3	4.0	2	1.0E-14	9.9E-16	2.0E-15
		4,040,705	Ra-226	0.7	.02	0.3	1.6E-16	4.9E-17	1.0E-16
		4,040,705	Th-230	<0.2		0.2	<1.0E-16		1.0E-16
		4,040,705	U-Nat	0.8		0.3	1.9E-16		1.0E-16
AM7	6/29/2013	4,354,243	Pb-210	50.9	4.4	2	1.2E-14	1.0E-15	2.0E-15
		4,354,243	Ra-226	0.8	0.2	0.3	1.7E-16	4.6E-`7	1.0E-16
		4,354,243	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		4,354,243	U-Nat	1.2		0.3	2.7E-16		1.0E-16
AM8	6/29/2013	4,628,230	Pb-210	44.7	4.2	2	9.7E-15	9.1E-16	2.0E-15
		4,628,230	Ra-226	1.5	0.3	0.3	3.3E-16	6.5E-17	1.0E-16
		4,628,230	Th-230	1.4	0.4	0.2	3.1E-16	8.6E-17	1.0E-16

Air Station ID	Collection Date	Air Volume Sampled (L)	Analyte	Filter Conc. (pCi/filter)	Precision (pCi/filter)	Reporting Limit (pCi/filter)	Concentration (µCi/mL)	Precision (µCi/mL)	Reporting Limit (µCi/mL)
		4,628,230	U-Nat	1.8		0.3	3.9E-16		1.0E-16
AM9	6/29/2013	4,604,134	Pb-210	46.2	4.3	2	1.0E-14	9.3E-16	2.0E-15
		4,604,134	Ra-226	0.7	0.2	0.3	1.6E-16	4.3E-17	1.0E-16
		4,604,134	Th-230	0.4	0.2	0.2	<1.0E-16		1.0E-16
		4,604,134	U-Nat	77.2		0.3	1.3E-16		1.0E-16
AM10	6/29/2013	3,832,148	Pb-210	42.0	4.0	2	1.1E-14	1.0E-15	2.0E-15
		3,832,148	Ra-226	0.7	0.2	0.3	1.7E-16	5.2E-17	1.0E-16
		3,832,148	Th-230	0.3	0.2	0.2	<1.0E-16		1.0E-16
		3,832,148	U-Nat	0.7		0.3	1.7E-16		1.0E-16

[1] *flow was less than minimum required flow of 3,000,000 Liters per quarter*

Table 17
Summary of Radioparticulate Concentrations at Air Monitoring Stations

Air Station ID	Analyte	Radioparticulate Concentration (uCI/ml)			Air Station ID	Analyte	Radioparticulate Concentration (uCI/ml)		
		Minimum	Maximum	Mean			Minimum	Maximum	Mean
AM-1	Pb-210	9.40E-15	1.90E-14	1.36E-14	AM6	Pb-210	8.70E-15	1.70E-14	1.35E-14
	Ra-226	1.10E-16	1.20E-15	3.33E-16		Ra-226	1.10E-16	2.70E-16	1.68E-16
	Th-230	1.50E-16	3.50E-16	2.53E-16		Th-230	<1.00E-16	<1.00E-16	<1.00E-16
	U-Nat	1.10E-16	2.40E-16	1.56E-16		U-Nat	1.50E-16	2.20E-16	1.80E-16
AM-2	Pb-210	5.40E-15	1.90E-14	1.30E-14	AM-7	Pb-210	1.20E-14	1.50E-14	1.34E-14
	Ra-226	1.40E-16	1.40E-15	3.00E-16		Ra-226	1.00E-16	2.50E-16	1.57E-16
	Th-230	1.20E-16	7.00E-16	2.72E-16		Th-230	1.00E-16	2.10E-16	1.55E-16
	U-Nat	1.20E-16	6.20E-16	2.55E-16		U-Nat	1.00E-16	2.70E-16	1.78E-16
AM-3	Pb-210	4.60E-15	1.80E-14	1.32E-14	AM-8	Pb-210	9.40E-15	1.70E-14	1.30E-14
	Ra-226	1.20E-16	8.50E-16	3.65E-16		Ra-226	1.30E-16	1.10E-14	1.55E-15
	Th-230	1.00E-16	7.60E-16	3.38E-16		Th-230	1.20E-16	1.70E-14	4.06E-15
	U-Nat	1.40E-16	8.90E-16	3.08E-16		U-Nat	1.20E-16	1.10E-15	4.22E-16
AM-4	Pb-210	8.60E-15	2.10E-14	1.50E-14	AM-9	Pb-210	9.50E-15	1.80E-14	1.35E-14
	Ra-226	1.30E-16	5.90E-16	2.42E-16		Ra-226	1.10E-16	9.90E-15	1.11E-15
	Th-230	1.10E-16	4.60E-16	2.02E-16		Th-230	1.40E-16	1.90E-14	1.20E-14
	U-Nat	1.50E-16	9.40E-16	3.49E-16		U-Nat	1.20E-16	2.00E-16	1.60E-16
AM-5	Pb-210	6.70E-15	2.00E-14	1.40E-14	AM-10	Pb-210	1.50E-16	1.60E-14	7.01E-15
	Ra-226	1.10E-16	2.50E-15	4.63E-16		Ra-226	1.70E-16	1.40E-14	3.68E-15
	Th-230	1.50E-16	5.20E-16	3.35E-16		Th-230	1.50E-16	1.80E-14	1.07E-14
	U-Nat	1.10E-16	4.70E-16	1.90E-16		U-Nat	1.00E-16	1.70E-16	1.28E-16

Appendix 3-B
Water Flow and Quality Monitoring Data

Table 1
Crooks Creek Discharge Measurements – Energy Fuels Monitoring Stations [1]

Location	Date	Discharge (cfs)
XSCCDS	6/16/2010	5.4
XSCCDS	8/17/2010	5.7
XSCCDS	10/6/2010	3.3
XSCCDS	3/30/2011	4.1
XSCCDS	5/18/2011	3.7
XSCCDS	3/14/2012	7.6
XSCCDS	5/18/2012	4.1
Weir	8/13/2012	2.4
Weir	9/20/2012	2.6
Weir	10/25/2012	3.5
Weir	3/6/2013	3.8
Weir	4/24/2013	4.2
Weir	5/8/2013	3.6
Weir	6/26/2013	2.3
XSCCUS	5/24/2010	6.8
XSCCUS	6/16/2010	4.6
XSCCUS	8/17/2010	5.5
XSCCUS	10/6/2010	3.3
XSCCUS	3/30/2011	3.8
XSCCUS	5/18/2011	3.8
XSCCUS	3/14/2012	5.9
XSCCUS	5/18/2012	3.6
XSCCMU	5/18/2011	3.3
XSCCMU	3/14/2012	Frozen
XSCCMU	5/15/2012	2.9
[1] Lidstone and Associates, Inc., 2013.		

Table 2
West Fork of Crooks Creek Discharge Measurements – USGS Gaging Station #06638300

Date	Flow (cfs)	Comments
1961	22	Peak flow measurement from gage.
3/1962	128	Peak flow measurement from gage.
1963	26	Peak flow measurement from gage.
1964	26	Peak flow measurement from gage.
4/1965	67	Peak flow measurement from gage.
1966	13	Peak flow measurement from gage.
1967	13	Peak flow measurement from gage.
1968	13	Peak flow measurement from gage.
1969	13	Peak flow measurement from gage.
4/24/1970	12	Peak flow measurement from gage.
4/1971	108	Peak flow measurement from gage.
4/1972	51	Peak flow measurement from gage.
5/20/1973	97	Peak flow measurement from gage.
4/20/1974	3	Peak flow measurement from gage.
7/10/1975	255	Peak flow measurement from gage.
4/10/1976	1.0	Instantaneous measurement during sampling.
5/14/1976	1.3	Instantaneous measurement during sampling.
5/19/1976	2	Peak flow measurement from gage.
6/9/1976	0.95	Instantaneous measurement during sampling.
7/1/1976	1.5	Estimated flow during sampling.
8/2/1976	1.0	Estimated flow during sampling.
9/16/1976	0.96	Instantaneous measurement during sampling.
10/1/1976	1.4	Instantaneous measurement during sampling.
4/11/1977	2.2	Instantaneous measurement during sampling.
4/27/1977	1.6	Instantaneous measurement during sampling.
5/31/1977	1.3	Instantaneous measurement during sampling.
6/30/1977	0.5	Instantaneous measurement during sampling.
7/25/1977	37	Peak flow measurement from gage.
8/4/1977	1.6	Instantaneous measurement during sampling.
9/13/1977	0.75	Instantaneous measurement during sampling.
10/3/1977	1.3	Instantaneous measurement during sampling.
3/31/1978	2.2	Instantaneous measurement during sampling.
5/30/1978	2.6	Instantaneous measurement during sampling.
6/27/1978	1.0	Instantaneous measurement during sampling.
7/21/1978	29	Peak flow measurement from gage.
8/3/1978	3.5	Instantaneous measurement during sampling.
8/29/1978	0.85	Instantaneous measurement during sampling.
4/20/1979	3	Peak flow measurement from gage.
4/23/1980	49	Peak flow measurement from gage.
5/24/1981	17	Peak flow measurement from gage.

Table 3
Surface Water Sampling History – Energy Fuels

Year	Quarter	Crooks Creek			Perennial Impoundments		Ephemeral Impoundments		
		XSCCMU	XSCCUS	XSCCDS	McIntosh Pit	Western Nuclear Pond	SW-1	SW-2	SW-3
2010	1st	NA	NA	NA	NA	NA	NA	NA	NA
	2nd	NA	5/25; 6/28	5/25; 6/29	6/28	NA	4/13; 5/25	4/13; 5/25	4/13
	3rd	NA	7/22; 8/18; 9/14	7/22; 8/18; 9/21	9/14	NA	Dry	Dry	Dry
	4th	NA	10/7; 11/15	10/7; 11/15; 12/10	11/17	NA	NA	NA	NA
2011	1st	NA	3/29	3/16; 3/29	3/28	NA	NA	NA	NA
	2nd	5/19	4/28; 5/19; 6/21	4/28; 5/19; 6/21	6/21	NA	NA	NA	NA
	3rd	8/17; 9/26	8/17; 9/26	8/17; 9/26	8/17	8/17	NA	NA	NA
	4th	10/31	10/31	10/31		NA	NA	NA	NA
2012	1st	Frozen	3/14	3/14	3/28	NA	3/14	3/14	3/28
	2nd	4/16; 5/15; 6/27	4/16; 5/15; 6/27	4/16; 5/15; 6/27	5/14	NA	4/16	Dry	Dry
	3rd	7/23; 8/13; 9/20	7/23; 8/13; 9/20	7/23; 8/13; 9/20	8/13	NA	NA	NA	NA
	4th	10/25; 11/28	10/25; 11/28	10/25; 11/28	11/28	NA	NA	NA	NA
2013	1st	3/6	3/6	Frozen	Frozen	Frozen	NA	NA	NA
	2nd	4/24; 5/8; 6/26	4/24; 5/8; 6/26	4/24; 5/8; 6/26	4/24; 6/26	4/24; 6/26	4/24	Dry	Dry

Note:
NA = Not Analyzed.

Table 4
Surface Water and Groundwater Quality Regulatory Criteria

	WDEQ-WQD Surface Water Criteria				WDEQ-WQD Groundwater Class-of-Use Criteria				EPA Drinking Water Criteria		
Parameter	**Aquatic Life Acute Value**	**Aquatic Life Chronic Value**	**Human Health Value Fish & Drinking Water**	**Human Health Value Fish Only**	**Domestic (Class I)**	**Agriculture (Class II)**	**Livestock (Class III)**	**Special (A) Fish & Aquatic**	**MCL**	**Treatment Action Level**	**Secondary Standard**
Aluminum	--	--	--	--	--	5.0	5.0	0.1	--	--	0.05 to 0.2
Ammonia	--	--	--	--	0.5	--	--	0.02	--	--	--
Arsenic	0.340	0.150	0.010	0.010	0.05	0.1	0.2	0.05	0.010	--	--
Barium	--	--	2.000	--	2.0	--	--	5.0	2.0	--	--
Beryllium	--	--	--	--	--	0.1	--	0.011	--	--	--
Boron	--	--	--	--	0.75	0.75	5.0	--	--	--	--
Cadmium	0.0020	0.00025	0.0050	--	0.005	0.01	0.05	0.0004	0.005	--	--
Chloride	860.000	230.000		--	250.0	100.0	2000.0	--	--	--	250.0
Chromium	0.016	0.011	0.100	--	0.1	0.1	0.05	0.05	0.005	--	--
Copper	0.013	0.009	1.000	--	1.0	0.2	0.5	0.01	--	1.0	--
Fluoride			2.000	--	4.0	--	--	--	4.0	--	2.0
Gross Alpha (pCi/L, including Radium-226, excluding Radon & Uranium)	--	--	--	--	15.0	15.0	15.0	15.0	15.0	--	--
Iron	--	1.000	0.300	--	0.300	5.0	--	0.5	--	--	--
Lead	0.0646	0.003	0.015	--	0.015	5.0	0.1	0.004	--	0.015	--
Managnese	3.110	1.462	0.050	--	0.05	0.2	--	1.0	0.05	--	--
Mercury	0.0014	0.00077	0.00005	0.000051	0.002	--	0.00005	0.00005	0.002	--	--
Nickel	0.4682	0.052	0.100	4.600	--	0.2	--	0.05	--	--	--
Nitrate	--	--		--	10.0	--	--	--	10.0	--	--
Nitrate+Nitrite (as N)	--	--	10.000	--	--	--	--	--	--	--	--
pH (standard units)	--	--	6.5 - 9.5	--	6.5 - 8.5	4.5 - 9.0	6.5 - 8.5	6.5 - 9.0	--	--	6.5 - 8.5
Radium-226+Radium-228 (pCi/L)	--	--	--	--	5.0	5.0	5.0	5.0	5.0	--	--
Selenium	0.020	0.005	0.050	4.200	0.05	0.02	0.01	0.05	0.05	--	--
Sulfate	--	--	--	--	250.0	200.0	3000.0	--	--	--	250.0
Total Dissolved Solids	--	--	--	--	500.0	2000.0	5000.0	500.0	--	--	500.0
Uranium	--	--	--	--	--	--	--	0.03	0.03	--	--
Vanadium	--	--	--	--	--	0.1	0.1	--	--	--	--
Zinc	0.1172	0.1181	5.000	26.000	5.0	2.0	25.0	0.05	--	--	5.0

All concentrations are in mg/L unless otherwise noted. Dashes indicate no criteria have been established.
WQD Class-of-Use criteria are from Table I in Chapter 8 (Quality Standards for Wyoming Groundwater) of the WQD Rules & Regulations, available at http://deq.state.wy.us/wqd/WQDrules/Chapter_08.pdf, accessed on November 3, 2008.
EPA Drinking Water Criteria are from http://www.epa.gov/safewater/consumer/pdf/mcl.pdf, accessed on November 3, 2008. Excludes parameters, such as pesticides, which are not likely to be present at the site.

Table 5
Energy Fuels Crooks Creek Water Quality Summary – Energy Fuels Sampling

	XSCCMU (May 2011 through June 2013)						XSCCUS (May 2010 through June 2013)						XSCCDS (May 2010 through June 2013)					
	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects
MAJOR IONS (mg/L)																		
Total Alkalinity as CaCO3	121	161	136	8.78	0	16	110	164	145	12.5	0	27	107	168	150	12.8	0	28
Alkalinity, Bicarbonate	139	197	162	12.4	0	16	108	191	172	17.1	0	27	130	199	177	14.1	0	28
Alkalinity, Carbonate	<5	<5	-	-	100	16	<5	13	7.8	3.1	85	27	<5	9	7	2	79	28
Chloride	2	6	3	1	0	16	2	6	3	1	0	27	2	5	4	1	0	28
Fluoride	0.1	0.2	0.2	0.0	0	16	<0.1	0.2	0.2	0.0	4	27	<0.1	0.5	0.2	0.07	7	28
Sulfate	19	39	25	5.1	0	16	14	38	31	5.6	0	27	19	46	36	6.2	0	28
Nitrogen, Ammonia	<0.1	**0.4**	**0.2**	0.1	81	16	<0.1	**0.1**	**0.1**	0.0	93	2	<0.1	**0.5**	**0.4**	0.2	93	28
Nitrogen, Nitrate & Nitrite	<0.1	0.2	0.2	0.0	94	16	<0.1	0.2	0.2	0.0	96	27	<0.1	0.1	0.1	0	96	28
Calcium	36	47	41	2.6	0	16	12	49	44	7.2	0	27	31	53	47	4.2	0	28
Magnesium	4	5	4.2	0.4	0	16	4	11	5	1	0	27	4	6	6	0.6	0	28
Potassium	1	3	1.8	0.6	0	16	1	4	2	0.6	0	27	1	4	2	0.6	0	28
Sodium	15	23	18	2.0	0	16	16	25	21	2.2	0	27	17	28	24	2.5	0	28
Silica	18	23	21	1.3	0	16	2	24	20	4	0		13	23	21	2.0	0	28
PHYSICAL PROPERITES																		
pH (std units)	8.0	8.5	8.4	0.12	0	16	8.0	***9.3***	8.4	0.24	0	27	8.0	***8.6***	8.4	0.15	0	28
Conductivity (umho/cm)	267	371	311	28.8	0	16	259	390	336	32.1	0	27	289	416	359	34	0	28
Total Dissolved Solids @ 180°C (mg/l)	180	300	223	28.7	0	16	170	350	243	38.2	0	27	150	290	247	31.5	0	28
Total Suspended Solids	<5	18	9.5	5.1	73	15	<5	26	12	5.4	46	26	<5	46	18	12	19	27
Turbidity (NTU)	0.6	4.3	1.8	0.9	0	15	1.2	8.3	3.0	1.8	0	26	1.5	26.1	7.0	6.4	0	26
Field pH (std units)	7.0	8.6	8.0	0.43	0	15	7.1	8.9	8.2	0.41	0	23	6.7	9.1	8.3	0.54	0	24
Field Conductivity (umho/cm)	236	396	312	44.0	0	14	290	418	366	32.9	0	22	312	723	402	75.2	0	24
Field Temperature (°C)	1.1	37	15	8.4	0	15	0.4	37.6	13	9	0	23	0.60	38.6	13	8.8	0	23
Field Turbidity (NTU)	1.0	167	15	41	0	15	2.0	460	33	102	0	21	3.0	147	15	31	0	20
TRACE METALS (mg/L) DISSOLVED																		
Aluminum	<0.1	<0.1	-	-	100	16	<0.1	<0.1	-	-	100	27	<0.1	<0.1	-	-	100	28
Arsenic	<0.001	0.008	0.002	0.002	19	16	<0.001	0.006	0.002	0.001	37	27	<0.005	0.008	0.002	0.002	32	28
Barium	<0.1	<0.1	-	-	100	16	<0.1	<0.1	-	-	100	27	<0.1	<0.1	-	-	100	28
Beryllium	<0.001	<0.001	-	-	100	16	<0.001	<0.001	-	-	100	27	<0.001	<0.001	-	-	100	28
Boron	<0.1	<0.1	-	-	100	16	<0.1	0.2	0.2	0.0	96	27	<0.1	0.2	0.2	0	4	28
Cadmium	<0.001	<0.001	-	-	100	16	<0.001	<0.001	-	-	100	27	<0.001	<0.001	-	-	100	28
Chromium	<0.01	<0.01	-	-	100	16	<0.001	<0.001	-	-	100	27	<0.01	<0.01	-	-	100	28
Copper	<0.01	<0.01	-	-	100	16	<0.01	<0.01	-	-	100	27	<0.01	<0.01	-	-	100	28
Iron	<0.05	0.14	0.1	0.03	13	16	<0.05	0.18	0.1	0.03	11	27	<0.05	0.15	0.08	0.03	18	28
Lead	<0.01	<0.01	-	-	100	16	<0.01	<0.01	-	-	100	27	<0.01	<0.01	-	-	100	28
Manganese	<0.02	0.04	0.02	0.01	6	16	<0.01	***0.08***	0.04	0.02	11	27	<0.02	0.04	0.02	0.01	29	28
Mercury	<0.001	<0.001	-	-	100	16	<0.001	<0.001	-	-	100	27	<0.001	<0.001	-	-	100	28
Molybdenum	<0.01	<0.01	-	-	100	16	<0.01	<0.01	-	-	100	27	<0.01	<0.01	-	-	100	28
Nickel	<0.05	<0.05	-	-	100	16	<0.05	<0.05	-	-	100	27	<0.05	<0.05	-	-	100	28
Selenium	<0.001	0.001	0.001	0.000	94	16	<0.001	0.001	0.001	0.000	96	27	<0.001	0.002	0.002	0.001	86	28
Uranium	0.0105	0.0171	0.0105	0.00212	0	16	0.0094	0.0611	0.016	0.0093	0	27	0.0137	0.0279	0.0198	0.00297	0	28
Vanadium	<0.1	<0.1	-	-	100	16	<0.1	<0.1	-	-	100	27	<0.1	<0.1	-	-	100	28
Zinc	<0.01	0.1	0.1	0.0	94	16	<0.01	0.01	0.01	0.00	96	27	<0.01	0.02	0.02	0.00	93	28

Table 5
Energy Fuels Crooks Creek Water Quality Summary – Energy Fuels Sampling (continued)

	XSCCMU (May 2011 through June 2013)							XCSSUS (May 2010 through June 2013)						XSCCDS (May 2010 through June 2013)					
Analyses	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Sample Size with Non-Detects**	**Percent Non-Detect (%)**	**Sample Size with Non-Detects**	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**Sample Size with Non-Detects**	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**Sample Size with Non-Detects**
TRACE METALS (mg/L) TOTAL																			
Iron	0.09	**0.69**	**0.3**	0.16	16	0	16	0.08	**0.63**	**0.34**	0.10	0	27	0.2	***1.5***	***0.5***	0.3	0	28
Manganese	<0.02	***0.06***	0.04	0.01	16	6	16	0.03	***0.11***	***0.06***	0.02	0	27	0.02	***0.11***	0.05	0.02	0	28
RADIOMETRICS (pCi/L) DISSOLVED																			
Unadjusted Gross Alpha	8.7	***18.3***	14	2.7	16	0	16	8.2	***48.5***	14	8.2	0	20	12.0	***20.4***	***16.4***	2.45	0	19
Gross Beta	3.2	6.9	4.8	1.0	16	0	16	<3	10.4	5.31	1.66	5	19	4.4	83.7	10	17	0	19
Lead 210	<1	4.3	2.0	0.93	16	44	16	<1	5.3	1.6	1.1	44	27	<1	4.2	1.8	0.83	44	27
Polonium 210	<1	1.2	1.2	0.0	16	94	16	<1	<1	-	-	100	27	<1	1.3	1.3	0	96	27
Radium 226	0.5	1.2	0.9	0.2	16	0	16	0.7	2.1	0.9	0.3	0	27	0.6	1.6	0.9	0.2	0	27
Radium 228	<1	<1	-	-	16	100	16	<1	1.9	1.5	0.33	89	27	<1	1.2	1.1	0.05	89	27
Thorium 230	<0.2	<0.2	-	-	16	100	16	<0.2	0.3	0.3	0.00	93	27	<0.2	0.59	0.59	0.00	96	27
RADIOMETRICS (pCI/L) SUSPENDED																			
Lead 210	<1	4.0	2	1	16	63	16	<1	3.5	1.9	0.95	67	27	<1	5.3	1.9	1.3	67	27
Polonium 210	<1	<1	-	-	16	100	16	<1	4.4	4.3	0.19	89	27	<1	2.3	2.3	0.05	93	27
Radium 226	<0.2	***7.1***	1.9	3.0	16	75	16	<0.2	3.6	0.53	0.80	41	27	<0.2	***6.3***	0.78	1.4	33	27
Thorium 230	<0.2	0.2	0.2	0.0	16	94	16	<0.2	0.3	0.3	0.05	93	27	<0.2	2.2	0.74	0.74	81	27
Uranium (mg/L)	<0.0003	0.0007	0.001	0.000	16	94	16	<0.0003	***0.118***	***0.04***	0.06	89	27	<0.0003	***0.287***	***0.04***	0.09	71	28
NOTES:																			
0.01	Concentration exceeds WDEQ-WQD Surface Water standard.																		
0.01	Concentration exceeds WDEQ-WQD Groundwater Classification criteria.																		
0.01	Concentration exceeds WDEQ-WQD Surface Water Standard & Groundwater Classification criteria.																		
0.01	Concentration exceeds EPA criteria.																		
Highlight for concentration exceeding WDEQ-WQD criteria is based on the lowest criteria exceeded.																			
If detection limit is greater than WDEQ-WQD or EPA criteria, and all values are non-detect, concentration is not highlighted.																			

Table 6
McIntosh Pit and Western Nuclear Pond Water Quality Summary – Energy Fuels Sampling

	McIntosh Pit (June 2010 through June 2013)						Western Nuclear Pond (August 2011 through June 2013)					
Analyses	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**SampleSize with Non-Detects**	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**SampleSize with Non-Detects**
MAJOR IONS (mg/L)												
Total Alkalinity as CaCO3	56	150	125	22.7	0	12	128	169	155	19.1	0	3
Alkalinity, Bicarbonate	68	169	150	26.0	0	12	156	196	180	17.1	0	3
Alkalinity, Carbonate	<5	7	7	0.0	92	12	<5	9	9	0.0	67	3
Chloride	3	19	7	4	0	12	3	5	4	1	0	3
Fluoride	0.1	0.2	0.2	0.04	0	12	0.1	0.4	0.3	0.1	0	3
Sulfate	99	***302***	223	46	0	12	20	32	27	5.1	0	3
Nitrogen, Ammonia	<0.1	<0.1	-	-	100	12	<0.1	**2.6**	**1.4**	1.3	33	3
Nitrogen, Nitrate & Nitrite	<0.1	<0.1	-	-	100	12	<0.1	<0.1	-	-	100	3
Calcium	29	63	57	9.1	0	12	33	38	36	2.4	0	3
Magnesium	3	8	7	1	0	12	4	12	9	4	0	3
Potassium	2	4	3	1	0	12	1	4	3	1	0	3
Sodium	38	108	94	19	0	12	16	27	23	5.0	0	3
PHYSICAL PROPERITES												
pH (std units)	8.0	8.5	8.3	0.13	0	12	8.3	***8.7***	8.5	0.16	0	3
Conductivity (umho/cm)	313	841	738	136	0	12	299	392	360	43.2	0	3
Total Dissolved Solids @ 180°C (mg/L)	210	***600***	***511***	98.2	0	12	200	260	237	26.2	0	3
Total Suspended Solids	<5	62	23	23	33	6	<5	77	64	14	33	3
Turbidity (NTU)	1.1	16.3	5.7	5.7	0	6	3.2	19.3	10	6.7	0	3
Field pH (std units)	6.8	8.7	8.1	0.55	0	10	8.3	9.1	8.7	0.32	0	3
Field Conductivity (umho/cm)	380	872	769	137	0	10	270	436	352	67.8	0	3
Field Temperature (°C)	1	23	12	7	0	11	7	20	15	6.0	0	3
Field Turbidity (NTU)	1.7	57	10	17	0	9	12.2	32.0	20	8.8	0	3
TRACE METALS (mg/L) DISSOLVED												
Aluminum	<0.1	<0.1	-	-	100	12	<0.1	<0.1	-	-	100	3
Arsenic	<0.001	<0.001	-	-	100	12	<0.005	0.002	0.002	0	67	3
Barium	<0.1	<0.1	-	-	100	12	<0.1	<0.1	-	-	100	3
Beryllium	<0.001	<0.001	-	-	100	12	<0.001	<0.001	-	-	100	3
Boron	<0.1	<0.1	-	-	100	12	<0.1	<0.1	-	-	100	3
Cadmium	<0.001	<0.001	-	-	100	12	<0.001	<0.001	-	-	100	0
Chromium	<0.01	<0.01	-	-	100	12	<0.01	<0.01	-	-	100	0
Copper	<0.01	<0.01	-	-	100	12	<0.01	<0.01	-	-	100	3

Table 6
McIntosh Pit and Western Nuclear Pond Water Quality Summary – Energy Fuels Sampling (cont.)

Analyses	McIntosh Pit (June 2010 through June 2013)						Western Nuclear Pond (May 2010 through June 2013)					
	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect	Sample Size with Non-Detects
TRACE METALS (mg/L) DISSOLVED (continued)												
Iron	<0.05	0.06	0.1	0.0	92	12	<0.05	0.09	0.09	0.00	67	3
Lead	<0.01	<0.01	-	-	100	12	<0.01	<0.01	-	-	100	3
Manganese	<0.01	<0.01	-	-	100	12	<0.01	0.04	0.04	0.00	67	3
Mercury	<0.001	<0.001	-	-	100	12	<0.001	<0.001	-	-	100	3
Molybdenum	<0.02	0.01	0.01	0.00	42	12	<0.01	<0.01	-	-	100	3
Nickel	<0.05	<0.05	-	-	100	12	<0.05	<0.05	-	-	100	3
Selenium	<0.005	0.005	0.004	0.001	33	12	<0.001	<0.001	-	-	100	3
Uranium	***1.26***	***3.69***	***3.21***	0.624	0	12	0.0124	***0.108***	***0.0761***	0.0451	0	3
Vanadium	<0.1	<0.1	-	-	100	12	<0.1	<0.1	-	-	100	3
Zinc	<0.01	0.02	0.02	0.00	67	12	<0.01	<0.01	-	-	100	3
TRACE METALS (mg/L) TOTAL												
Iron	<0.05	0.27	0.15	0.08	42	12	0.24	**0.55**	**0.39**	0.13	0	3
Manganese	<0.01	<0.01	-	-	100	12	0.07	***0.25***	***0.1***	0.08	0	3
RADIOMETRICS (pCi/L) DISSOLVED												
Unadjusted Gross Alpha	**804**	**2340**	**1863**	427	0	9	12.8	**60.7**	**44.2**	22.2	0	3
Gross Beta	281	1230	720	323	0	9	3.0	26.4	16	9.6	0	3
Lead 210	1.0	45.5	10	12	0	12	1.4	5.7	3.6	1.8	0	3
Polonium 210	<1	1.4	1.4	0.0	91	12	<1	<1	-	-	100	3
Radium 226	***10.8***	***41.4***	***19.1***	7.75	0	12	<0.2	1.6	1.4	0.25	33	3
Radium 228	<1	5.09	2.59	1.08	33	12	<1	<1	-	-	100	3
Thorium 230	<0.2	0.2	0.2	0.0	92	12	<0.2	<0.2	-	-	100	3
RADIOMETRICS (pCi/L) SUSPENDED												
Lead 210	<1	121	20.6	33.0	8	12	1.4	2.4	1.7	0.47	0	3
Polonium 210	<1	10.3	4.00	3.69	67	12	<1	<1	-	-	100	3
Radium 226	0.2	***7.5***	1.9	1.9	0	12	0.8	1.2	0.97	0.17	0	3
Thorium 230	<0.2	16.7	2.8	4.7	17	12	0.5	0.7	0.6	0.09	0	3
Uranium (mg/L)	0.0009	0.0206	0.005	0.01	0	12	0.0006	0.0012	0.001	0.0002	0	3
RADIOMETRICS (pCi/L) TOTAL												
Unadjusted Gross Alpha	**1450**	**2368**	**1908**	375	0	3	NA	NA	NA	NA	NA	NA
Gross Beta	854	1121	989	109	0	3	NA	NA	NA	NA	NA	NA

NOTES:

0.01	Concentration exceeds WDEQ-WQD Surface Water standard.
0.01	Concentration exceeds WDEQ-WQD Groundwater Classification criteria.
0.01	Concentration exceeds WDEQ-WQD Surface Water Standard & Groundwater Classification criteria.
0.01	Concentration exceeds EPA criteria.

Highlight for concentration exceeding WDEQ-WQD criteria is based on the lowest criteria exceeded.

If detection limit is greater than WDEQ-WQD or EPA criteria, and all values are non-detect, concentration is not highlighted.

NA = Not Analyzed.

Table 7
Ephemeral Impoundments SW-1, SW-2, and SW-3 Water Quality Summary – Energy Fuels Sampling

	SW-1 (April 2010 through May 2013) (Dry 3 of the 8 observations from April 2010 to May 2013)						SW-2 (April 2010 through May 2013) (Dry 4 of the 7 observations from April 2010 to May 2013)						SW-3 (April 2010 through May 2013) (Dry 5 of the 7 observations from April 2010 to May 2013)					
Analyses	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**Sample Size with Non-Detects**	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**Sample Size with Non-Detects**	**Minimum**	**Maximum**	**Average Without Non-Detects**	**Standard Deviation Without Non-Detects**	**Percent Non-Detect (%)**	**Sample Size with Non-Detects**
MAJOR IONS (mg/L)																		
Alkalinity as CaCO3	33	251	131	90	0	4	25	94	60	35	0	2	15	15	15	0	0	1
Alkalinity, Bicarbonate	40	305	159	98	0	5	27	114	57	40	0	3	18	36	27	9	0	2
Alkalinity, Carbonate	<5	<5	-	-	100	5	<5	<5	-	-	100	3	<5	<5	-	-	100	2
Chloride	<1	**105**	40.3	45.7	40	5	<1	1	1	0	33	3	<1	<1	-	-	100	2
Fluoride	<0.1	0.3	0.2	0.04	20	5	<0.1	0.1	0.1	0	67	3	<0.1	<0.1	-	-	100	2
Sulfate	18.0	***3790***	***817***	1488	0	5	1.0	5	4	2	0	3	8	8	8	0	0	2
Nitrogen, Ammonia	<0.05	**0.2**	**0.2**	0.0	60	5	<0.05	<0.1	-	-	100	3	<0.05	<0.1	-	-	100	2
Nitrogen, Nitrate & Nitrite	<0.1	0.2	0.2	0.0	80	5	<0.1	<0.1	-	-	100	3	<0.1	<0.1	-	-	100	2
Calcium	9	233	69	84	0	5	4	27	13	10	0	3	6	8	7	1	0	2
Magnesium	10	118	29.2	44.6	20	5	<1	4	2.5	1.5	33	3	1	1	1	0	100	2
Potassium	2	18	7	6	0	5	4	7	5	1	0	3	2	3	2.5	1	0	2
Sodium	3.00	1670	358	656	0	5	<1	3	3	0	67	3	<1	1	1	0	50	2
Silica as SiO2	4.0	15	10.0	4.0	0	5	2.2	12	7.4	4	0	3	2.9	3	3	0.1	0	2
PHYSICAL PROPERITES																		
pH (std units)	7.1	8.3	7.9	0.5	0	5	6.7	8.0	7.2	0.5	0	3	7.1	7.5	7.3	0.2	0	2
Conductivity (umho/cm)	114	8240	1932	3160	0	5	45	194	105	64	0	3	60	72	66	6	0	2
Total Dissolved Solids @ 180°C	100	***7010***	***1610***	2704	0	5	62	220	147	65	0	3	50	126	88	38	0	2
Total Suspended Solids	34	2040	708	796	0	4	260	1210	735	475	0	2	28	28	28	0	0	1
Turbidity (NTU)	16.3	3440	942	1444	0	4	295	2520	1408	1113	0	2	95	95	95	0	0	1
Field pH (std units)	7.4	8.6	8.1	0.53	0	3	7.3	7.3	7.3	0	0	1	8.3	8.3	8.3	0	0	1
Field Conductivity (umho/cm)	8.3	173	103	69	0	3	103	103	103	0	0	1	73	73	73	0	0	1
Field Temperature (°C)	6.2	15.8	10	4.3	0	3	7.4	7.4	7.4	0	0	1	13.2	13.2	13	0.0	0	1
Field Turbidity (NTU)	27.8	1000	427	416	0	3	NA	NA	NA	NA	NA	NA	121	121	121	0	0	1
TRACE METALS (mg/L) DISSOLVED																		
Aluminum	<0.1	***1.2***	***0.50***	0.50	40	5	0.1	***1.4***	***0.57***	0.59	0	3	0.1	***0.3***	***0.20***	0.10	0	2
Arsenic	<0.001	0.002	0.001	0	40	5	<0.001	0.001	0.001	0	67	3	<0.001	<0.001	-	-	100	2
Barium	<0.1	0.2	0.1	0.05	40	5	<0.1	<0.1	-	-	100	3	<0.1	<0.1	-	-	100	2
Beryllium	<0.001	<0.001	-	-	100	4	<0.001	<0.001	-	-	100	2	<0.001	<0.001	-	-	100	1
Boron	<0.1	0.3	0.3	0	80	5	<0.1	<0.1	-	-	100	3	<0.1	<0.1	-	-	100	2
Cadmium	<0.001	<0.005	-	-	100	5	<0.001	<0.005	-	-	100	3	<0.001	<0.005	-	-	100	2
Chromium	<0.01	<0.05	-	-	100	5	<0.01	<0.05	-	-	100	3	<0.01	<0.05	-	-	100	2
Copper	<0.01	**0.01**	**0.01**	0	80	5	<0.01	<0.01	-	-	100	3	<0.01	<0.01	-	-	100	2

Table 7
Ephemeral Impoundments SW-1, SW-2, and SW-3 Water Quality Summary – Energy Fuels Sampling (cont.)

Analyses	SW-1 (April 2010 through May 2013)						SW-2 (April 2010 through May 2013)						SW-3 (April 2010 through May 2013)					
	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects	Minimum	Maximum	Average Without Non-Detects	Standard Deviation Without Non-Detects	Percent Non-Detect (%)	Sample Size with Non-Detects
TRACE METALS (mg/L) DISSOLVED (continued)																		
Iron	<0.05	0.5	0.3	0.2	40	5	0.1	0.6	0.3	0.2	0	3	0.08	0.11	0.095	0.015	100	2
Lead	<0.01	<0.02	-	-	100	5	<0.001	<0.01	-	-	100	3	<0.01	0.001	0.001	0	50	2
Manganese	<0.01	0.23	0.23	0.00	80	5	<0.01	0.01	0.01	0	67	3	<0.01	<0.01	-	-	100	2
Mercury	<0.001	<0.001	-	-	100	5	<0.001	<0.001	-	-	100	3	<0.001	<0.001	-	-	100	2
Molybdenum	<0.01	0.05	0.04	0.02	60	5	<0.01	<0.1	-	-	100	3	<0.01	<0.1	-	-	100	2
Nickel	<0.01	<0.05	-	-	100	5	<0.05	<0.05	-	-	100	3	<0.05	<0.05	-	-	100	2
Selenium	<0.005	0.008	0.006	0.002	20	5	<0.001	<0.001	-	-	100	3	<0.001	<0.001	-	-	100	2
Uranium	0.137	15.0	4.0	5.6	0	5	0.003	0.08	0.031	0.03	0	3	0.013	0.03	0.022	0.008	0	2
Vanadium	<0.02	<0.1	-	-	100	5	<0.1	<0.1	-	-	100	3	<0.1	<0.1	-	-	100	2
Zinc	<0.01	0.02	0.02	0	80	5	<0.01	0.02	0.02	0	67	3	<0.01	<0.01	-	-	100	2
TRACE METALS (mg/L) TOTAL																		
Iron	0.52	27.5	7.2	10.2	0	5	3.94	19.8	10.0	7.0	0	3	1.84	20.8	11.3	9.5	0	2
Manganese	0.02	0.49	0.2	0.2	0	5	0.04	0.23	0.1	0.1	0	3	0.02	0.16	0.09	0.07	0	2
RADIOMETRICS (pCi/L) DISSOLVED																		
Unadjusted Gross Alpha	336	10400	3449	4043	0	4	9.1	1340	675	665	0	2	56.7	94.3	76	19	0	2
Gross Beta	77.6	3700	1185	1462	0	4	11.9	458	235	223	0	2	24.7	46	35	11	0	2
Lead 210	12.3	27	19	6.6	0	4	<1	24	24	0.0	50	2	3.9	3.9	3.9	0	0	1
Polonium 210	<1	11.1	6.3	4.9	50	4	<1	9.8	9.8	0.0	50	2	1.6	1.6	1.6	0	0	1
Radium 226	<0.2	656	166	283	20	5	0.52	878	293	413	0	3	5.7	9.8	8	2	0	2
Radium 228	<1	22.6	8.93	9.7	40	5	0.9	36.5	13.2	16.5	0	3	1.2	1.5	1.35	0.1	0	2
Thorium 230	0.28	9.7	3.1	3.9	0	4	0.55	5.2	2.9	2.3	0	2	4.7	4.7	4.7	0	0	1
RADIOMETRICS (pCi/L) SUSPENDED																		
Lead 210	2.7	293	91	118	0	4	4.5	210	107	103	0	2	10.9	10.9	10.9	0	0	1
Polonium 210	<1	9.5	5.0	3.4	25	4	<1	2.4	2.4	0.0	50	2	1.2	1.2	1.2	0	0	1
Radium 226	1.5	314	89	130	0	4	6.6	204	105	99	0	2	14.9	14.9	14.9	0	0	1
Thorium 230	2.4	305	85	127	0	4	6.1	188	97	91	0	2	8.8	8.8	8.8	0	0	1
Uranium (mg/L)	0.02	38.5	10	17	0	4	0.34	16.0	8	8	0	2	0.031	0.031	0.031	0	0	1
RADIOMETRICS (pCi/L) TOTAL																		
Unadjusted Gross Alpha	1560	1560	1560	0	0	1	104	104	104	0	0	1	NA	NA	NA	NA	NA	NA
Gross Beta	1035	1035	1035	0	0	1	58.2	58	58	0	0	1	NA	NA	NA	NA	NA	NA

NOTES:

0.01	Concentration exceeds WDEQ-WQD Surface Water standard.
0.01	Concentration exceeds WDEQ-WQD Groundwater Classification criteria.
0.01	Concentration exceeds WDEQ-WQD Surface Water Standard & Groundwater Classification criteria.
0.01	Concentration exceeds EPA criteria.

Highlight for concentration exceeding WDEQ-WQD criteria is based on the lowest criteria exceeded.
If detection limit is greater than WDEQ-WQD or EPA criteria, and all values are non-detect, concentration is not highlighted.
NA = Not Analyzed.

Table 8
Groundwater Quality Mean Values (Q2 2010 through Q3 2013) – Energy Fuels Sampling

Analyses / Well No. & Completion	Mean Concentrations																					
Well No.	PZ-1	PZ-2	PZ-3	PZ-4	PZ-5	PZ-7	PZ-8	PZ-9	PZ-10	MW-6	MW-6N	MW-6S	MW-7	MW-9	MW-10	G-3	G-4	G-5	G-6	G-7	G-8	Sheep I
Completion	PAA	PAA	PAA	PAA	PAA	PAA	PAA	PAA	Ft. Union	PAA	Cody Shale	Cody Shale	PAA	PAA	PAA	Cody Shale	PAA	PAA	Battle Spring	Battle Spring	PAA	PAA
MAJOR IONS (mg/L)																						
Alkalinity	172	98	141	164	105	117	105	231	153	185	403	482	234	207	162	340	186	139	196	218	330	97
Bicarbonate	210	118	158	196	121	117	102	278	186	220	451	544	280	235	176	411	226	169	237	266	402	118
Carbonate	<5	<5	<5	5.3	6.4	<5	18.0	5.0	<5	5.3	20.2	21.5	5.5	9.2	11.4	5.8	<5	<5	5.1	5.0	<5	<5
Chloride	10	3	4	6	4	6	2	18	5	13	11	***262***	4	32	4	14	6	5	17	19	14	4
Fluoride, Total	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.7	0.4	0.2	0.3	0.1	0.2	0.2	0.2	0.2	0.1	0.5	0.1
Sulfate	77	8	159	20	36	***384***	53	170	73	106	***219***	6	28	190	40	***1287***	132	***349***	145	***296***	**220**	**223**
Nitrogen, Ammonia	***0.09***	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	***0.2***	***0.15***	***0.2***	***0.4***	***0.7***	***0.2***	***0.6***	***0.5***	<0.1	<0.1	***0.1***	***0.1***	***0.3***	***0.2***
Nitrogen, Nitrate & Nitrite	0.55	<0.1	0.14	0.16	<0.1	<0.1	<0.1	0.17	0.10	<0.1	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	<0.1	0.18	0.11	2.15	<0.1	<0.1
Calcium, Dissolved	54	17	62	49	11	116	12	22	54	43	4	6	43	4	2	165	81	133	88	166	55	17
Magnesium, Dissolved	7	2	5	7	1	23	2	6	13	10	1	2	19	1	1	93	10	18	10	16	12	4
Potassium, Dissolved	2	2	2	2	1	5	2	4	2	3	2	3	5	3	4	9	2	3	2	4	7	3
Sodium, Dissolved	46	27	62	17	54	60	58	157	20	73	300	399	33	205	90	424	34	39	50	38	181	126
Silica	20	15	17	12	11	19	8	8	25	13	8	9	9	8	16	11	22	23	19	23	10	4
PHYSICAL PROPERITES																						
pH (Std. Units)	8.0	8.3	8.0	8.3	8.4	7.4	***8.6***	8.3	7.9	8.2	***8.7***	***8.6***	8.1	8.4	***8.6***	8.2	8.1	7.6	8.1	8.0	8.1	8.0
Conductivity (umho/cm)	503	210	608	357	292	946	325	846	426	601	1228	1675	481	944	400	2720	618	935	713	997	1060	706
Solids, Total Dissolved TDS @ 180°C (mg/L)	352	145	419	223	192	733	253	***597***	316	398	***854***	***965***	272	***608***	***635***	***2296***	416	***738***	486	***788***	***630***	475
Solids, Total Suspended (mg/L)	3.1	9.0	<5	<5	7.2	-	-	-	-	7.7	15.5	32.0	48.1	942	1471.8	74.8	33.3	34.0	372.0	107.0	22300.0	-
Field pH (std units)	7.1	8.3	7.7	7.9	8.5	***8.7***	***8.6***	7.9	7.8	***8.6***	***8.6***	8.4	7.8	8.4	***8.8***	7.4	7.5	6.5	7.5	7.0	-	7.7
Field Conductivity (umho/cm)	520	219	623	356	297	733	373	939	476	540	1294	1748	481	8.7	389	2741	585	891	697	951	-	390
Field Temperature (°C)	10.2	2.6	9.8	9.4	10.4	6.1	9.3	9.5	9.1	8.6	9.2	9.3	10.6	9.7	9.9	8.6	8.7	9.1	9.2	9.9	-	13.0
Field Turbidity (NTU)	7	1	1	5	<1	29	13	9	11	24	31	123	31	57	612	115	44	65	342	186	-	25
Dissolved Oxygen (mg/l)	2.7	2.6	2.6	2.7	1.9	6.0	4.1	4.3	4.3	4.1	1.7	2.6	1.9	2.2	2.0	3.7	3.2	3.2	3.8	4.0	-	3.0
TRACE METALS (mg/L) DISSOLVED																						
Aluminum	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	***0.15***	***0.16***	***0.4***	<0.1	***0.11***	***1.1***	<0.1	<0.1	<0.1	***0.11***	<0.1	<0.1	<0.1
Arsenic	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	<0.005	0.002	<0.005	<0.005	***0.0104***	0.003	<0.005	<0.005	<0.005	<0.001	0.001	<0.001
Barium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.001	<0.001
Boron	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.10	0.3	<0.1	<0.1	<0.1	0.6	<0.1	<0.1	<0.1	<0.1	0.20	<0.1
Cadmium	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.04**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.011**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 8
Groundwater Quality Mean Values (Q2 2010 through Q3 2013) – Energy Fuels Sampling (cont.)

Analyses / Well No. & Completion	Mean Concentrations																					
Well No.	PZ-1	PZ-2	PZ-3	PZ-4	PZ-5	PZ-7	PZ-8	PZ-9	PZ-10	MW-6	MW-6N	MW-6S	MW-7	MW-9	MW-10	G-3	G-4	G-5	G-6	G-7	G-8	Sheep I
Completion	PAA	PAA	PAA	PAA	PAA	PAA	PAA	PAA	Ft. Union	PAA	Cody Shale	Cody Shale	PAA	PAA	PAA	Cody Shale	PAA	PAA	Battle Spring	Battle Spring	PAA	PAA
TRACE METALS (mg/L) DISSOLVED (continued)																						
Iron	<0.05	0.0578	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.11	0.22	<0.05	<0.05	**0.33**	<0.05	<0.05	<0.05	<0.05	0.095	<0.05	<0.05
Lead	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01
Manganese	0.05	<0.02	***0.06***	<0.02	<0.02	***0.29***	<0.02	<0.02	0.02	***0.10***	0.01	0.02	0.03	<0.02	<0.02	***0.65***	***0.13***	***0.26***	***0.17***	***0.16***	***0.39***	<0.1
Mercury	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	0.03	0.02
Nickel	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Selenium	0.005	<0.005	<0.005	<0.005	0.002	<0.005	0.004	<0.005	<0.005	<0.005	<0.005	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	0.020	<0.005	**0.0295**	0.004	<0.001
Uranium	***0.74***	0.00354	0.00492	***0.257***	0.002	***0.50***	***0.16***	***0.044***	***0.067***	***0.0785***	0.00222	0.0008	0.0074	0.0021	0.0086	***0.104***	***0.0396***	***0.395***	***0.0640***	***6.6400***	***0.3740***	***0.1890***
Vanadium	0.08	0.08	<0.1	0.08	<0.1	<0.02	0.05	<0.02	<0.1	<0.1	<0.1	<0.1	<0.1	0.08	<0.1	0.02	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Zinc	<0.01	0.011	0.01	<0.01	0.011	0.1	0.1	0.3	0.02	0.02	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	0.013	0.05	0.012	<0.01	<0.01	<0.01
TRACE METALS (mg/L) TOTAL																						
Iron, Total (mg/L)	**0.92**	0.06	<0.05	0.25	<0.05	**5.43**	**0.39**	**0.38**	**0.45**	**0.32**	**1.38**	**3.28**	**1.45**	0.18	**9.89**	**4.78**	**0.75**	**3.80**	**10.20**	**1.05**	**136.00**	**3.79**
Manganese, Total (mg/L)	***0.15***	<0.02	***0.06***	<0.02	<0.02	***0.32***	***0.13***	0.04	0.03	***0.14***	0.03	***0.06***	0.04	<0.02	***0.17***	***0.72***	***0.18***	***0.28***	***0.39***	***0.17***	***2.83***	***0.12***
RADIOMETRICS (pCi/L) DISSOLVED																						
Gross Alpha	***459.3***	***17.6***	11.3	***160.8***	9.3	***189.0***	***120.0***	***27.2***	***21.7***	***35.0***	7.7	4.0	***22.8***	6.6	***65.0***	***57.4***	***48.8***	***265.5***	***46.6***	***4115.0***	***252.0***	-
Adjusted Gross Alpha	6.5	***15.3***	7.5	5.00	8	***33.3***	***32.7***	<1	1.7	4.4	6.2	3.7	***18.3***	5.7	***63.3***	<1	***22.0***	***10.9***	5.2	<1	<1	-
Lead 210	3.0	3.2	0.9	3.4	1.9	4.7	15.7	2.5	1.6	3.1	1.5	1.7	1.3	1.4	6.9	2.3	3.2	4.3	4.6	6.8	-	15.3
Polonium 210	<1.0	1.66	1.15	1.086	<1.0	1.6	1.8	1.33	1	<1.0	<1.0	<1.0	<1.0	1.06	6.1	1.17	<1.0	<1	2.0	<1	-	<1
Radium 226	***3.8***	***9.9***	***2.6***	***2.4***	2.0	***16.1***	3.2	2.8	***4.8***	3.0	0.6	0.4	***11.4***	2.4	***5.6***	0.9	***19.0***	***5.7***	***4.3***	***18.0***	***8.0***	***24.5***
Radium 228	***2.3***	***1.1***	***4.0***	***2.9***	1.9	***4.2***	<1.0	<1	***5.4***	1.7	1.3	<1.0	***1.2***	1.1	***4.0***	1.1	***4.3***	***6.5***	***3.4***	***3.5***	***-***	***1.6***
Thorium 230	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	0.6	<0.2	<0.2	<0.2	<0.2	<0.2	0.2	1.5	<0.2	0.5	0.2	0.4	<0.2	-	<0.2
RADIOMETRICS (pCi/L) SUSPENDED																						
Lead 210	7.2	2.6	1.3	8.6	1.2	75.0	29.4	25.8	29.7	1.7	1.4	0.8	2.9	1.7	18.5	2.4	7.7	5.2	9.0	8.3	-	18.1
Polonium 210	0.85	1.4	1.18	5.5	<1.0	10.0	12.3	1.6	4.0	<1.0	<1.0	<1.0	1.05	1.13	13.2	1.01	1.6	1.5	1.32	1.725	-	5
Radium 226	2.5	0.4	0.2	0.4	<0.2	2.6	0.2	0.3	0.7	0.4	0.4	0.3	1.5	0.5	***16.5***	1.5	***7.8***	4.2	***14.3***	***4.8***	***207.0***	***56.5***
Thorium 230	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.7	<0.2	<0.2	<0.2	0.6	0.5	6.0	0.7	1.3	0.8	14.3	9.0	-	4.2
Uranium S(mg/L)	0.001	<0.0003	<0.0003	0.0003	<0.0003	***0.1***	0.001	0.0004	0.0004	0.0006	***0.0036***	0.0003	0.001	0.0009	***0.031***	0.003	0.002	***0.01***	***0.02***	***0.02***	***0.14***	***0.02***
RADIOMETRICS (pCi/L) TOTAL																						
Gross Alpha	***374.3***	***20.5***	9.9	***196.3***	9.8	***508.5***	***223.0***	***63.0***	***72.7***	-	14.6	4.3	***32.1***	***31.5***	***370.4***	-	-	-	-	-	-	208.5
Gross Beta	134	9	9	81	6	334	102	49	74	-	12	4	15	16	104	-	-	-	-	-	-	107

Table 8
Groundwater Quality Mean Values (Q2 2010 through Q3 2013) – Energy Fuels Sampling (cont.)

Analyses / Well No. & Completion	Mean Concentrations																				
	PZ-1	**PZ-2**	**PZ-3**	**PZ-4**	**PZ-5**	**PZ-7**	**PZ-8**	**PZ-9**	**PZ-10**	**MW-6**	**MW-6N**	**MW-6S**	**MW-7**	**MW-9**	**MW-10**	**G-3**	**G-4**	**G-5**	**G-6**	**G-7**	**G-8**	**Sheep I**
	PAA	**PAA**	**PAA**	**PAA**	**PAA**	**PAA**	**PAA**	**PAA**	**Ft. Union**	**PAA**	**Cody Shale**	**Cody Shale**	**PAA**	**PAA**	**PAA**	**Cody Shale**	**PAA**	**PAA**	**Battle Spring**	**Battle Spring**	**PAA**	**PAA**

Notes:

Well completion indicates the formation in which the well is completed. PAA indicates Project Area Aquifer, i.e., undifferentiated Battle Spring and Fort Union Formations.

Wells PZ-7 through PZ-9 were sampled from 3Q 2010 through 1Q 2011, and Well PZ-10 was sampled from 3Q 2010 through 2Q 2011.

Well MW-6 and the G series wells were completed in 2011. Sampling of Well MW-6 began in Q1 2011. Sampling of Wells G-3 through G-6 began in 2Q 2011, and Sampling of Well G-7 began in 4Q 2012.

Well G-8 is essentially dry. Data represents one sampling event in March 2013, without well purge

The Sheep 1 Shaft was sampled in 3Q and 4Q 2010.

0.01	Concentration exceeds WDEQ-WQD Surface Water standard.
0.01	Concentration exceeds WDEQ-WQD Groundwater Classification criteria.
0.01	Concentration exceeds WDEQ-WQD Surface Water Standard & Groundwater Classification criteria.
0.01	Concentration exceeds EPA criteria.

Highlight for concentration exceeding WDEQ-WQD criteria is based on the lowest criteria exceeded.

If detection limit is greater than WDEQ-WQD or EPA criteria, and all values are non-detect, concentration is not highlighted.

Appendix 3-C
Water Rights

Table 1
Surface Water Rights within the Project Area and within 0.5 Mile Downstream of the Project Area

Stream Source	Water Right (WR) Number	Twn	Rng	Sec	Qtr-Qtr	Latitude	Longitude	Priority Date	Facility Name	Company / Owner	Facility Type	Total Capacity (AF/Yr)	Diversion Capacity at Headgate (CFS)	Active Capacity (AF)	Inactive Capacity (AF)	Size of Reservoir (AF)	Total Flow (CFS) / Approp. (GPM)	Uses	Summary Water Right (WR) Status
Sheep Creek Drainage																			
Sheep Creek	CR CC29/283	028N	092W	22	NW1/4NE1/4	42.39021	-107.80159	12/31/1903	Sheep Creek Ditch No. 1	JESSE JOHNSON	Stream			0	0	0	0.78	IRR_SW	
Sheep Creek	CR CC29/284	028N	092W	22	NW1/4NE1/4	42.39021	-107.80159	5/24/1901	Sheep Creek Ditch No. 2	JESSE JOHNSON	Stream			0	0	0	0.8	IRR_SW	
Sheep Creek	P3197.0D	028N	092W	22	NW1/4NE1/4	42.390565	-107.803613	5/24/1901	Sheep Creek Ditch No. 2	MATILDA J. MCLAUGHLIN	Stream		-1	0	0	0	1.14	IRR_SW	Fully Adjudicated
Sheep Creek	P17019.0D	028N	092W	15	NE1/4NW1/4	42.404658	-107.807458	8/31/1925	Sheep Creek Pipe Line No. 1	UNION OIL COMPANY OF CALIFORNIA	Stream		0.026	0	0	0	0.03	DOM_SW; DRI; MIS_SW; OIL; STO	Fully Adjudicated
Sheep Creek	CR CC45/287	028N	092W	15	NE1/4NW1/4	42.40466	-107.80642	8/31/1925	Sheep Creek Pipe Line No. 1	UNION OIL COMPANY OF CALIFORNIA	Stream			0	0	0	0.03	DOM_SW	
Spring	CR CC45/288	028N	092W	15	NE1/4NW1/4	42.40466	-107.80642	8/31/1925	Sheep Creek Pipe Line No. 2	UNION OIL COMPANY OF CALIFORNIA	Spring			0	0	0	0.03	DOM_SW	
Spring	P17020.0D	028N	092W	15	NE1/4NW1/4	42.404659	-107.806424	8/31/1925	Sheep Creek Pipe Line No. 2	UNION OIL COMPANY OF CALIFORNIA	Spring		0.026	0	0	0	0.03	DOM_SW; DRI; MIS_SW; OIL; STO	Fully Adjudicated
Crooks Creek Drainage																			
Quaking Asp Creek	CR CR11/187	028N	092W	32	SE1/4NE1/4	42.35781	-107.83578	3/11/1976	McIntosh No. 2 Stock Reservoir	U.S. ENERGY - CRESTED CORP.	Reservoir	14.2		0	0	14.2	0	STO	
Quaking Asp Creek	P8104.0S	028N	092W	32	SE1/4NE1/4	42.357816	-107.835783	3/11/1976	McIntosh No. 2 Stock Reservoir	U.S. ENERGY/CRESTED CORPORATION	Reservoir	14.2		0	0	14.2	0	STO	Fully Adjudicated
McIntosh Draw	P8393.0R	028N	092W	32	SE1/4NE1/4	42.357817	-107.835783	3/13/1981	McIntosh Pit Reservoir	JENNIFER MCINTOSH	Reservoir	537.35		0	537.35	537.35	0	STO; WL	Complete
Sheehan Springs Draw	P7714.0R	028N	092W	29	SE1/4NE1/4	42.372132	-107.835668	3/11/1976	McIntosh No. 1 Reservoir	U.S. ENERGY/CRESTED CORPORATION	Spring	481.36		0	0	481.36	0	MIN; MIS_SW; COMBBU	Unadjudicated
Sheehan Spring	P22281.0D	028N	092W	28	SW1/4NW1/4	42.372118	-107.830837	6/20/1958	Sheehan Spring Diversion	HEALD PROJECT #2	Spring		0.1	0	0	0	0.1	DOM_SW; MIN	
Crook's Creek	CR CC37/076	028N	092W	20	SE1/4SW1/4	42.37938	-107.84526	5/20/1907	Crook's Creek Ditch	RED CREEK SHEEP COMPANY	Stream			0	0	0	1.06	IRR_SW	
Crook's Creek	P7774.0D	028N	092W	20	SE1/4SW1/4	42.379657	-107.84661	5/20/1907	Crook's Creek	CABRIN LEMMON	Stream		-1	0	0	0	1.06	IRR_SW	Fully Adjudicated

Stream Source	Water Right (WR) Number	Twn	Rng	Sec	Qtr-Qtr	Latitude	Longitude	Priority Date	Facility Name	Company / Owner	Facility Type	Total Capacity (AF/Yr)	Diversion Capacity at Headgate (CFS)	Active Capacity (AF)	Inactive Capacity (AF)	Size of Reservoir (AF)	Total Flow (CFS) / Approp. (GPM)	Uses	Summary Water Right (WR) Status
									Ditch										
Crook's Creek	P35001.0D	028N	092W	20	SE1/4SW1/4	42.38	-107.846889	5/13/2013	Crooks Gap Water Haul	FREMONT COUNTY TRANSPORTATION DEPARTMENT	Stream			0	0	0	1	TEM	Complete
Crook's Creek	CR CC09/056	028N	092W	20	SW1/4NW1/4	42.38647	-107.8502	5/24/1901	Stevens Ditch No. 3	CHARLES JOHNSON	Stream			0	0	0	0.37	IRR_SW	
Crook's Creek	P3963.0E	028N	092W	19	NE1/4NE1/4	42.389991	-107.855153	1/10/1919	Stevens Ditch No. 3 {Enl. of}	CHARLES JOHNSON	Stream		3.75	0	0	0	1.39	IRR_SW	Unadjudicated
Crook's Creek	P3195.0D	028N	092W	19	NE1/4NE1/4	42.390468	-107.853921	5/24/1901	Stevens Ditch No. 3	GILBERT STEVENS	Stream		-1	0	0	0	1.5	IRR_SW	Fully Adjudicated
Crook's Creek	P17025.0D	028N	092W	18	NE1/4SE1/4	42.397083	-107.854889	10/5/1925	Crooks Creek 2" Water Line Pipeline	ATLANTIC RICHFIELD CO.	Stream		0.048	0	0	0	0.05	DOM_SW; DRI; MIS_SW; OIL; STO	Fully Adjudicated
Crook's Creek	CR CC45/559	028N	092W	18	NE1/4SE1/4	42.39722	-107.85504	10/5/1925	Crooks Creek 2" Water Line Pipeline	PRODUCERS REFINERS CORPORATION	Stream			0	0	0	0.05	DOM_SW; OIL; STO	
East Hanks Draw	P13991.0R	028N	092W	16	SE1/4SW1/4	42.393167	-107.825611	2/23/1987	Congo Pit Reservoir	ENERGY FUELS WYOMING INC	Reservoir			0	1234.5	1234.5	0	STO; WL	Incomplete

Note: Grey shading indicates water right within the Sheep Mountain Project and controlled by Energy Fuels, Inc.

Table 2
Surface Water Rights within 0.5 to 3 miles Downstream of the Project Area

Stream Source	Water Right (WR) Number	Twn	Rng	Sec	Qtr-Qtr	Latitude	Longitude	Priority Date	Facility Name	Company / Owner	Facility type	Total Capacity (AF/Yr)	Diversion Capacity at Headgate (CFS)	Active Capacity (AF)	Inactive Capacity (AF)	Size of Reservoir (AF)	Total Flow (CFS) / Approp. (GPM)	Uses	Summary Water Right (WR) Status
Sheep Creek Drainage																			
Sheep Creek	P7817.0D	028N	092W	4	SE1/4SE1/4	42.422752	-107.815744	5/20/1907	Sheep Creek Ditch No. 1	A.M. RUSHTON	Stream		-1	0	0	0	0.58	IRR_SW	Fully Adjudicated
Sheep Creek	CR CC29/285	028N	092W	4	SE1/4SE1/4	42.42256	-107.81621	5/20/1907	Sheep Creek Ditch No. 1	MRS. DAVID JOHNSON	Stream			0	0	0	0.57	IRR_SW	
Sheep Creek	P7823.0D	028N	092W	4	SE1/4SE1/4	42.422764	-107.815755	6/6/1907	Sheep Creek Ditch No. 2	A.M. RUSHTON	Stream			0	0	0	0.11	IRR_SW	Fully Adjudicated
Sheep Creek	CR CC29/286	028N	092W	4	SE1/4SE1/4	42.42256	-107.81621	6/6/1907	Sheep Creek Ditch No. 2	MRS. DAVID JOHNSON	Stream			0	0	0	0.11	IRR_SW	
Sheep Creek	CR CC35/125	028N	092W	4	NE1/4SE1/4	42.42615	-107.81622	6/26/1909	Sheep Creek Ditch No. 3	AMANDA M. JOHNSON	Stream			0	0	0	0	DOM_SW; STO	
Sheep Creek	P9136.0D	028N	092W	4	NE1/4SE1/4	42.426209	-107.817422	6/26/1909	Sheep Creek Ditch No. 3	DAVID JOHNSON	Stream		-1	0	0	0	0	DOM_SW; IRR_SW; STO	Fully Adjudicated
Sheep Creek	CR CC29/287	028N	092W	4	NE1/4SE1/4	42.42615	-107.81622	5/5/1909	Sheep Creek Ditch No. 4	MRS. DAVID JOHNSON	Stream			0	0	0	0.02	DOM_SW; IRR_SW; STO	
Sheep Creek	P8994.0D	028N	092W	4	NE1/4SE1/4	42.42623	-107.817438	5/5/1909	Sheep Creek Ditch No. 4	DAVID JOHNSON	Stream		-1	0	0	0	0.02	DOM_SW; IRR_SW; STO	Fully Adjudicated
Crooks Creek Drainage																			
Crook's Creek	P3963.0E	028N	092W	19	NE1/4NE1/4	42.389991	-107.855153	1/10/1919	Stevens Ditch No. 3 {Enl. of}	CHARLES JOHNSON	Stream		3.75	0	0	0	1.39	IRR_SW	Unadjudicated
Crook's Creek	P3195.0D	028N	092W	19	NE1/4NE1/4	42.390468	-107.853921	5/24/1901	Stevens Ditch No. 3	GILBERT STEVENS	Stream		-1	0	0	0	1.5	IRR_SW	Fully Adjudicated
Crook's Creek	CR CC79/013	028N	092W	7	SE1/4SE1/4	42.40644	-107.85558	9/22/1926	SUPPLY DITCH NO. 4 (AS CHANGED TO KIRK NO. 1 DITCH)	LONNIE J. CLAYTOR	Stream			0	0	0	0	RES	Fully Adjudicated
Crook's Creek	CR CC47/402	028N	092W	7	SE1/4SE1/4	42.40814	-107.85496	9/18/1919	Kirk Ditch No. 1	USDI BUREAU OF RECLAMATION	Stream			0	0	0	1.21	IRR_SW	
Crook's Creek	P15570.0D	028N	092W	7	SE1/4SE1/4	42.408306	-107.855056	9/18/1919	Kirk Ditch No. 1	LONNIE J. CLAYTOR	Stream		4.03	0	0	0	1.21	IRR_SW	Fully Adjudicated
Crook's Creek	CR CC47/403	028N	092W	7	NE1/4SE1/4	42.41175	-107.85493	9/18/1919	Kirk Ditch No. 2	USDI BUREAU OF RECLAMATION	Stream			0	0	0	0.17	IRR_SW	
Crook's Creek	P15571.0D	028N	092W	7	NE1/4SE1/4	42.413417	-107.854611	9/18/1919	Kirk Ditch No. 2	LONNIE J. CLAYTOR	Stream		1.1	0	0	0	0.17	IRR_SW	Fully Adjudicated
Crook's Creek	P17409.0D	028N	092W	5	SW1/4SW1/4	42.42263	-107.850089	9/22/1926	Supply Ditch No. 4 (as Changed to Kirk No. 1 Ditch)	LONNIE J. CLAYTOR	Stream		19.6	0	0	0	0	DOM_SW; IRR_SW; RES; STO	Fully Adjudicated
Crook's Creek	P17410.0D	028N	092W	5	SW1/4NW1/4	42.427997	-107.847668	9/24/1926	Kirk Pipe Line	J. M. KIRK	Stream		0.03	0	0	0	0.03	DOM_SW; STO	
Crook's Creek	P17412.0D	028N	092W	5	SW1/4NW1/4	42.428015	-107.847651	9/24/1926	Garden Ditch	J. M. KIRK	Stream		2	0	0	0	0	IRR_SW	
Crook's Creek	P17411.0D	028N	092W	5	NW1/4NW1/4	42.433373	-107.850002	9/24/1926	J. M. Ditch	J. M. KIRK	Stream		10	0	0	0	0	DOM_SW; IRR_SW; RES; STO	
Crook's Creek	P4073.0R	028N	092W	5	SW1/4NW1/4	42.429823	-107.849995	9/24/1926	J. M. Reservoir	J. M. KIRK	Reservoir	2.84		0	0	2.84	0	DOM_SW; IRR_SW; STO; COMBBU	

Stream Source	Water Right (WR) Number	Twn	Rng	Sec	Qtr-Qtr	Latitude	Longitude	Priority Date	Facility Name	Company / Owner	Facility type	Total Capacity (AF/Yr)	Diversion Capacity at Headgate (CFS)	Active Capacity (AF)	Inactive Capacity (AF)	Size of Reservoir (AF)	Total Flow (CFS) / Approp. (GPM)	Uses	Summary Water Right (WR) Status
Crook's Creek	CR CC09/053	029N	092W	34	NE1/4NW1/4	42.4478	-107.82829	08/10/1897	Rigby Reservoir Supply Ditch	MASON RIGBY	Stream			0	0	0	0	RES	
Crook's Creek	P1565.0D	029N	092W	34	NE1/4NW1/4	42.449083	-107.827417	08/10/1897	Rigby Reservoir Supply Ditch	MASON RIGBY	Stream		-1	0	0	0	0	RES	Fully Adjudicated
Thompson Gulch	P5429.0R	029N	092W	33	NE1/4SW1/4	42.440644	-107.847541	5/11/1933	Diehl Reservoir	HENRY C. DIEHL	Reservoir	23.19		0	0	23.19	0	DOM_SW; STO; COMBBU	

Table 3
Groundwater Rights within the Project Area and within 3 Miles of the Project Area

Water Right (WR) Number	Twn	Rng	Sec	Qtr-Qtr	Latitude	Longitude	Priority Date	Facility Name	Company / Owner	Total Depth (Ft)	Static Water Level (Ft)	Appropriation (GPM)	Well Log (Y/N)	Uses	Summary Water Right (WR) Status
P34440.0W	027N	092W	11	NW1/4NW1/4	42.3322	-107.7923	8/19/1976	ROCK WELL #1	GREEN MOUNTAIN MINING VENTURE	358	16.7	0		MIS	Incomplete
P35444.0W	027N	092W	11	NW1/4NW1/4	42.3322	-107.7923	10/29/1976	ROCK WELL #2	GREEN MOUNTAIN MINING VENTURE	99.6	11	0		MON	Complete
P102900.0W	027N	092W	10	NE1/4NE1/4	42.3322	-107.7971	7/5/1996	JP-40	GREEN MOUNTAIN MINING VENTURE	38	10.5	0		MON	
P147542.0W	027N	092W	2	SE1/4SE1/4	42.3357	-107.7776	10/21/2002	BEMW-001		98	56	0		MON	Complete
P147588.0W	027N	092W	2	SE1/4SE1/4	42.3357	-107.7778	10/22/2002	BEMW-002		80	51.6	0		MON	Complete
P147589.0W	027N	092W	2	SE1/4SE1/4	42.3357	-107.7778	10/22/2002	BEMW-003		95	73.25	0		MON	Complete
P147590.0W	027N	092W	2	SE1/4SE1/4	42.3357	-107.7778	10/22/2002	BEMW-004	KENNECOTT URANIUM CO.	100	73.2	0		MON	Complete
P147591.0W	027N	092W	2	SE1/4SE1/4	42.3357	-107.7778	10/22/2002	BEMW-005	KENNECOTT URANIUM CO.	120	90.06	0		MON	Complete
P147592.0W	027N	092W	2	NW1/4SE1/4	42.3393	-107.7825	10/22/2002	BEMW-006		170	148.99	0		MON	Complete
P181642.0W	027N	092W	1	NW1/4SW1/4	42.3393	-107.7727	6/8/2007	ENL. ZENITH #1 WELL	GREEN MOUNTAIN MINING VENTURE	850	210	0		MIS	Complete
P41033.0W	027N	092W	1	NW1/4SW1/4	42.3393	-107.7727	4/15/1977	ZENITH #1	GREEN MOUNTAIN MINING VENTURE	850	210	60		MIS	Adjudicated
CR UW03/438	027N	092W	1	NW1/4SW1/4	42.3393	-107.7727	4/15/1977	ZENITH #1	KENNETH L. MARBLE			60		MIS	
P49789.0W	028N	092W	33	NW1/4NW1/4	42.3613	-107.8309	7/25/1979	PIEZO #4	ENERGY FUELS WYOMING INC	220	168	0		MON	Complete
P49790.0W	028N	092W	32	SE1/4NE1/4	42.3578	-107.8358	7/25/1979	PIEZO #5	ENERGY FUELS WYOMING INC	440	134.5	0		MON	Complete
P49788.0W	028N	092W	29	SE1/4SE1/4	42.3649	-107.8357	7/25/1979	PIEZO #3	ENERGY FUELS WYOMING INC	280	129	0		MON	Complete
P33910.0W	028N	092W	29	NE1/4SE1/4	42.3685	-107.8357	5/18/1976	MCINTOSH WELL #2 (i.e., "Shop Well")	ENERGY FUELS WYOMING INC	250	160	5	N	MIS	Adjudicated
P43954.0W	028N	092W	29	NE1/4SE1/4	42.3685	-107.8357	6/14/1978	MCINTOSH WELL #3	ENERGY FUELS WYOMING INC	300	120.7	25	N	MIS	Adjudicated
P49786.0W	028N	092W	29	NE1/4SE1/4	42.3685	-107.8357	7/25/1979	PIEZO #1	ENERGY FUELS WYOMING INC	200	101	0		MON	Complete
CR UW04/134	028N	092W	29	NE1/4SE1/4	42.3685	-107.8357	5/18/1976	MCINTOSH WELL #2	WILLIAM MCINTOSH			5		MIS	
CR UW04/135	028N	092W	29	NE1/4SE1/4	42.3685	-107.8357	6/14/1978	MCINTOSH WELL #3	WILLIAM MCINTOSH			25		MIS	
P49787.0W	028N	092W	28	NE1/4SW1/4	42.3691	-107.8243	7/25/1979	PIEZO #2	ENERGY FUELS WYOMING INC	730	236	0		MON	Complete
P44469.0W	028N	092W	28	SW1/4NE1/4	42.3721	-107.8211	7/17/1978	SD 18 16	ENERGY FUELS WYOMING INC	1410	757	20		MIS	Unadjudicated
U.W. 201721	028N	092W	28	NW1/4NE1/4	42.3819	-107.8136	12/19/2013	SHEEP II SHAFT	ENERGY FUELS WYOMING INC.	3955		1000	N	MIS	Incomplete
P44886.0W	028N	092W	22	NE1/4SW1/4	42.3830	-107.8065	8/21/1978	PL-21A	ENERGY FUELS WYOMING INC	1410	675	35		MIS	Unadjudicated
U.W. 201720	028N	092W	22	NW1/4SW1/4	42.3741	-107.8223	12/19/2013	SHEEP I SHAFT	ENERGY FUELS WYOMING INC.	1940		1000	N	MIS	Incomplete
P1490.0W	028N	092W	21	SW1/4NE1/4	42.3865	-107.8211	5/6/1965	GOLDEN GOOSE WATER WELL NO.1	ENERGY FUELS WYOMING INC	800	-1	5		DOM_GW; IND_GW	Incomplete
P52291.0W	028N	092W	21	SE1/4NW1/4	42.3864	-107.8260	5/30/1980	PZ-8	ENERGY FUELS WYOMING INC	420	304	0		MON	Complete
P192612.0W	028N	092W	21	NE1/4NE1/4	42.3897	-107.8161	1/19/2010	CONGO MW 3	ENERGY FUELS WYOMING INC			0		MON	Incomplete
P52293.0W	028N	092W	21	NE1/4NE1/4	42.3902	-107.8162	5/30/1980	PZ-10	ENERGY FUELS WYOMING INC	400	31.55	0		MON	Complete
P28675.0W	028N	092W	20	SE1/4SE1/4	42.3793	-107.8356	8/27/1974	GOLDEN GOOSE II WATER	ENERGY FUELS WYOMING INC	500	0	7	N	IND_GW	Adjudicated
P4158.0W	028N	092W	20	SE1/4SE1/4	42.3793	-107.8356	1/12/1970	YELLOWSANDS NO.1	ENERGY FUELS WYOMING	500	200	12		DOM_GW;	Unadjudicated

Water Right (WR) Number	Twn	Rng	Sec	Qtr-Qtr	Latitude	Longitude	Priority Date	Facility Name	Company / Owner	Total Depth (Ft)	Static Water Level (Ft)	Appropriation (GPM)	Well Log (Y/N)	Uses	Summary Water Right (WR) Status
									INC					IND_GW	
CR UW04/136	028N	092W	20	NE1/4SE1/4	42.3828	-107.8356	8/27/1974	GOLDEN GOOSE II WATER	U.S. ENERGY-CRESTED CORPORATION			7		MIS	
P192613.0W	028N	092W	20	NE1/4NE1/4	42.3894	-107.8356	1/19/2010	CONGO MW 4	ENERGY FUELS WYOMING INC			0		MON	Incomplete
P52289.0W	028N	092W	20	NW1/4NE1/4	42.3899	-107.8404	5/30/1980	PZ-6C	ENERGY FUELS WYOMING INC	240	123	0		MON	Complete
P145360.0W	028N	092W	20	NE1/4NE1/4	42.3899	-107.8356	5/8/2002	PAY DIRT PIT				2500		MIS	
P52287.0W	028N	092W	20	NE1/4NE1/4	42.3899	-107.8356	5/30/1980	PZ-6A	ENERGY FUELS WYOMING INC	240	123	0		MON	Complete
P52288.0W	028N	092W	20	NW1/4NE1/4	42.3900	-107.8403	5/30/1980	PZ-6B	ENERGY FUELS WYOMING INC	241	124	0		MON	Complete
P409.0C	028N	092W	18	NE1/4NE1/4	42.4045	-107.8550	7/31/1945	CROOKS GAP STATION WATER WELL	SINCLAIR REFINING CO.	215	10	15		IND_GW	Incomplete
P192610.0W	028N	092W	16	SW1/4SW1/4	42.3931	-107.8309	1/19/2010	CONGO MW 1	ENERGY FUELS WYOMING INC			0		MON	Incomplete
P170167.0W	028N	092W	16	SW1/4SW1/4	42.3936	-107.8308	8/24/2005	PZ7	Wyo. State Lands & Investments			25		STK	
P172609.0W	028N	092W	16	SE1/4SW1/4	42.3937	-107.8260	12/14/2005	CONGO PIT NO. 1 WELL	ENERGY FUELS WYOMING INC			25		MIS	
P192611.0W	028N	092W	16	NW1/4SE1/4	42.3968	-107.8209	1/19/2010	CONGO MW 2	ENERGY FUELS WYOMING INC			0		MON	Incomplete
P52292.0W	028N	092W	16	NW1/4SE1/4	42.3976	-107.8206	5/30/1980	PZ-9	ENERGY FUELS WYOMING INC	840	205	0		MON	Complete
P16758.0W	028N	092W	12	NW1/4NE1/4	42.4188	-107.7630	11/29/1972	BOULDER SPRING #4039		8	-1	10		STK	Complete
P43197.0W	028N	092W	5	NW1/4SE1/4	42.4261	-107.8405	5/9/1978	BORDENS WELL #101		235	140	12		DOM_GW; STK	Complete
P148684.0W	028N	092W	5	SW1/4NE1/4	42.4297	-107.8405	12/3/2002	RIGBY PASTURE NO. 1		100	40	25		DOM_GW; STK	Complete
P7439.0P	029N	092W	33	SW1/4SE1/4	42.4370	-107.8430	5/15/1929	LAZY C S #1	BESSIE A. MCINTOSH	280	20	10		DOM_GW; STK	Complete

Note: Grey shading indicates water right within the Sheep Mountain Project and controlled by Energy Fuels, Inc.

Appendix 4-A
Air Quality Technical Support Document

AIR QUALITY TECHNICAL SUPPORT DOCUMENT
FOR THE ENERGY FUELS RESOURCES (USA) INC.
SHEEP MOUNTAIN PROJECT
ENVIRONMENTAL IMPACT STATEMENT

Prepared for

U.S. Department of the Interior
Bureau of Land Management
Lander Field Office
Lander, Wyoming

By

Carter Lake Consulting
Laramie, Wyoming

SLR Consulting
Fort Collins, Colorado

Two Lines, Inc.
Grand Junction, Colorado

Edge Environmental, Inc.
Lakewood, Colorado

May 2015

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List of Abbreviations and Acronyms

$\mu g/m^3$	micrograms per cubic meter
µeq/l	microequivalents per liter
ANC	Acid Neutralizing Capacity
AQD	Air Quality Division
AQRV	Air Quality Related Values
AQS	Air Quality System
AQTSD	Air Quality Technical Support Document
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BPIP	Building Profile Input Program
Carter Lake	Carter Lake Consulting
CASTNET	Clean Air Status and Trends Network
CAPCOA	California Air Pollution Control Officers Association
CBNG	Coal Bed Natural Gas
CD-C	Continental Divide-Creston
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
DATs	deposition analysis thresholds
Ddv	delta deciview

dv	deciview
Edge	Edge Environmental, Inc.
EIS	Environmental Impact Statement
Energy Fuels	Energy Fuels Resources (USA) Inc.
EPA	U.S. Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FLAG	Federal Land Managers Air Quality Related Values Workgroup
FLMs	Federal Land Managers
Forest Service	U.S. Forest Service
GHG	greenhouse gas
HAPs	hazardous air pollutants
K	degrees Kelvin
kg/ha-yr	kilograms per hectare per year
km	kilometers
LAC	level of acceptable change
m	meters
MMIF	Mesoscale Model Interface Program
N	nitrogen
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NED	National Elevation Data
NEPA	National Environmental Policy Act
NO_x	nitrogen oxides
NRC	Nuclear Regulatory Commission
NWS	National Weather Station
O_3	ozone
OLM	Ozone Limiting Method
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in size
PM_{10}	particulate matter less than or equal to 10 microns in size
ppb	parts per billion
PRISM	Parameter-elevation Regressions on Independent Slopes Model
Project	Sheep Mountain Project
PSD	Prevention of Significant Deterioration
S	sulfur
s	second
SLR	SLR Incorporated
SO_2	sulfur dioxide
TLI	Two Lines, Inc.
VOCs	volatile organic compounds
WAAQS	Wyoming Ambient Air Quality Standards
WDEQ	Wyoming Department of Environmental Quality
WestJumpAQMS	West-wide Jump Start Air Quality Modeling Study
WRAP	Western Regional Air Partnership
WRF	Weather Research and Forecasting
WRIR	Wind River Indian Reservation

1.0 INTRODUCTION

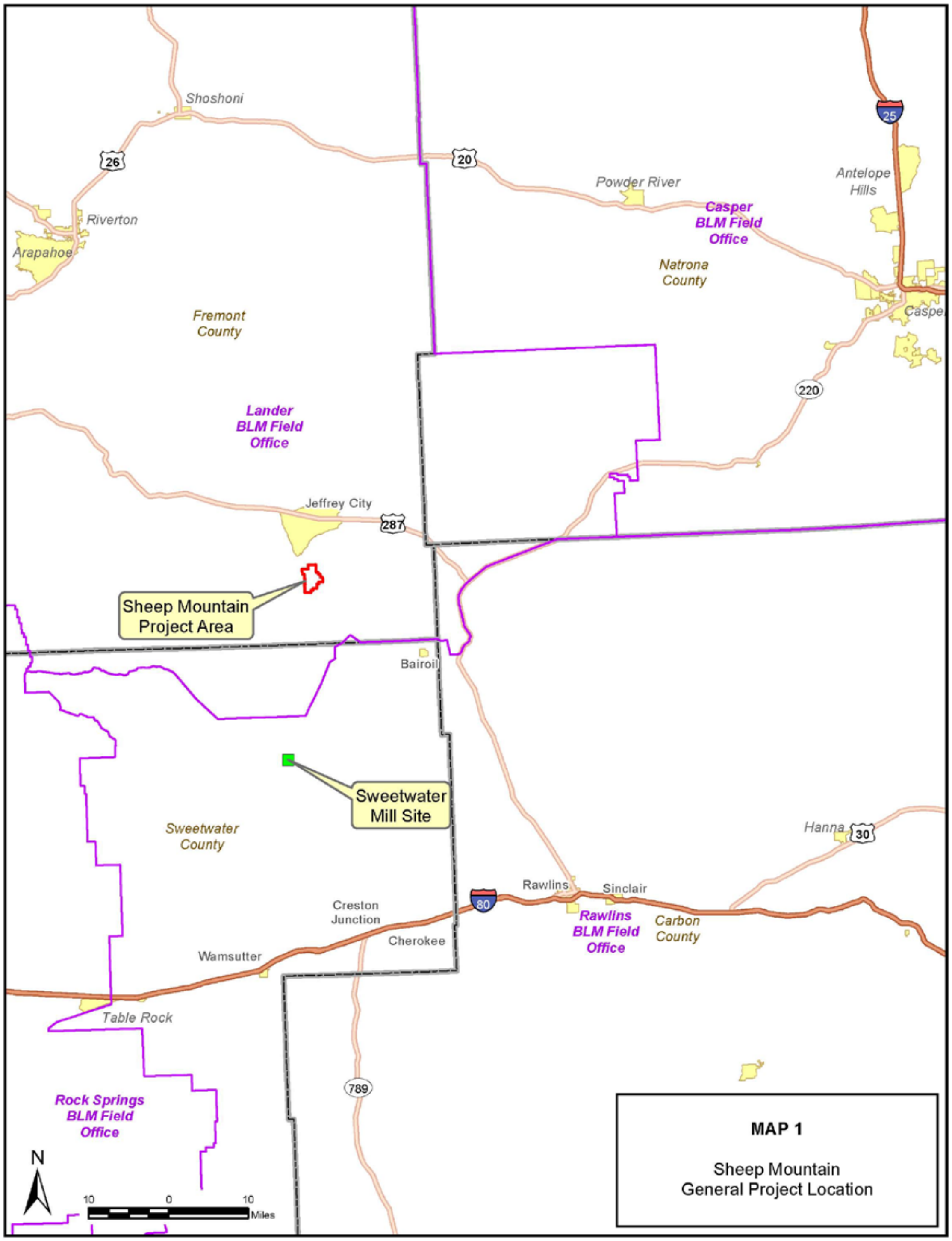
Carter Lake Consulting (Carter Lake), SLR Incorporated (SLR), Two Lines, Inc (TLI), and Edge Environmental, Inc. (Edge) have prepared this Air Quality Technical Support Document (AQTSD) to document the results of an air quality impact assessment conducted to quantify potential air quality impacts from the Energy Fuels Resources (USA) Inc. (Energy Fuels) Sheep Mountain Project (the Project). This assessment follows methodologies set forth in the Air Quality Impact Assessment Protocol prepared for the Bureau of Land Management (BLM) in March 2014 (BLM, 2014a), which documented the approach, input data, and computation methods to be used in the study.

The Sheep Mountain Project Area is located approximately 8 road miles south of Jeffrey City, Wyoming in Fremont County, Township 28 North, Range 92 West, Sections 4, 5, 9, 16, 17, 20, 21, 27, 29, 30, 32 and 33, as shown on Map 1. This area lies approximately 62 road miles southeast of Riverton, approximately 67 miles north of Rawlins, and approximately 105 road miles west of Casper and is located on Jeffrey City and Crooks Peak U.S. Geological Survey 7.5-minute topographic quadrangles. The Project Area includes approximately 3,625 surface acres (approximately 5.7 square miles) of mixed ownership including 2,313 acres of federal surface, 768 acres under state ownership, and 544 acres of fee lands. Approximately 2,836 acres of federal mineral estate is included in the Project Area.

The analysis includes an assessment of the potential near-field and far-field impacts to ambient air quality concentrations from the potential pollutant emissions associated with the Proposed Action and alternatives. The analysis utilizes the U.S. Environmental Protection Agency's (EPA's) Guideline model AERMOD to estimate potential pollutant impacts from proposed project sources within and nearby the Project Area, and the EPA Guideline model CALPUFF to estimate potential air quality and air quality related value (AQRV) impacts (impacts on visibility [regional haze], atmospheric deposition, and potential increases in acidification to acid sensitive lakes) at Prevention of Significant Deterioration (PSD) Class I and sensitive Class II areas of concern that are within 200 kilometers (km) of the Sheep Mountain Project Area.

The cumulative air quality emissions impacts (project source emissions and regional source emissions) are not analyzed herein. The regional modeling analysis for the Continental Divide-Creston (CD-C) Natural Gas Development Project Final Environmental Impact Statement – FEIS (BLM, 2014b) is used for addressing cumulative impacts for the Project. The CD-C Project analysis included a regional air quality assessment (including ozone) and AQRV analysis for southwest Wyoming including the region surrounding the Sheep Mountain Project Area. The analyses were performed using the CAMx model. The cumulative air quality and AQRV results for the CD-C Project FEIS are summarized in the Sheep Mountain Project Environmental Impact Statement (EIS).

Potential radiological impacts to members of the public were calculated for Project radon gas and radioparticulate emissions impacts using the MILDOS model (Version 3.10) (Argonne National Laboratory, 1989). The radiological modeling assessment is provided as Appendix B of this AQTSD.


Shoshoni
26
20
Riverton
Arapahoe
Powder River
Casper
BLM Field
Office
Antelope
Hills
25
Natrona
County
Casper
Fremont
County
220
Lander
BLM Field
Office
Jeffrey City
287
Sheep Mountain
Project Area
Bairoil
Sweetwater
Mill Site
Sweetwater
County
Hanna
30
Rawlins
Sinclair
80
Creston
Junction
Rawlins
BLM Field
Office
Carbon
County
Cherokee
Wamsutter
Table Rock
789
Rock Springs
BLM Field
Office
N
10
0
10
Miles
MAP 1
Sheep Mountain
General Project Location

1.1 Project Description

Proposed Action

Energy Fuels proposes to explore for, and develop uranium reserves to extract approximately 1.0 million to 2.0 million pounds of uranium from the ore per year during active operations (estimated at 20 years). Mining would be completed using conventional methods including both open-pit and underground methods. There are three principal phases in the Proposed Action: Construction, Operations, and Reclamation. The Proposed Action would require up to 929 acres of disturbance of which 356.5 acres would be new disturbance and 572.5 acres was previously disturbed.

Construction includes the building of facilities and installation of equipment that would be needed prior to Operations. Operations would include the mining and milling of uranium ore (Map 2). Conventional open pit (Congo Pit) and modified room and pillar underground (Sheep Underground) mining methods would be employed to remove mineralized uranium ore. Ore from both the Congo Pit and underground mine would be stockpiled at the entry to the underground mine on the Ore Stockpile for later transport to:

- An On-Site Ore Processing Facility, which would be licensed by the NRC as a uranium processing mill. Ore would be transported to this Facility via conveyor, which would be within the Project Area. The Facility would include a Heap Leach Pad for dissolution of the uranium from the ore; a series of Treatment Ponds (Holding Pond, Collection Pond, and Raffinate Pond) for the solution from the Pad; an Extraction Plant for removing the ore from solution, and a Precipitation and Packaging Plant.

- An Off-Site Ore Processing Facility. Ore would be transported to this location via truck to the Sweetwater Mill. The Sweetwater Uranium Mill is owned and operated by Kennecott Uranium Company (Kennecott), a division of Rio Tinto Americas, Inc. The mill is located entirely on private lands owned by Kennecott.

The option to pursue off-site processing is a sub-part of the Proposed Action because it is advanced by Energy Fuels. The Sweetwater Uranium Mill (owned and operated by Kennecott Uranium Company - Kennecott, a division of Rio Tinto) is located entirely on private lands owned by Kennecott and permitted with the NRC as an operating license under Source Material License SUA-1350 which allows for production of 4,100,000 pounds of yellowcake per year. Therefore, Kennecott could receive ore and begin operations under the stipulations of their permit at any time. For the purpose of analysis within this EIS, it is assumed that operations at the Sweetwater Mill would occur under the existing license without significant revisions, and impacts associated with the operations of the mill would be similar to those of the operation of the Heap Leach facility at Sheep Mountain and/or the Piñon Ridge Mill in Colorado in relation to applicable resources such as air and human health and safety. The impacts associated with hauling ore to the Sweetwater Mill from the Sheep Mountain site and operating the Sweetwater Mill are disclosed in this EIS because they are connected actions. However, the BLM would not be involved in permitting or authorizing hauling of ore to the Sweetwater Mill along county roads or processing at the Sweetwater Mill.

Reclamation would include decommissioning of facilities, backfilling, and re-vegetating of the mined areas, and covering of the heap leach pad to prepare for long-term care and maintenance by the State of Wyoming or the U.S. Department of Energy (DOE).

No Action Alternative

Under this Alternative, BLM would deny Energy Fuel's Plan of Operations as proposed. Therefore, the BLM would be denying the proponent's right to extract minerals on federal lands from their mining claims. The selection of the No Action Alternative may constitute a taking because it violates valid existing rights under the U.S. Mining laws and result in legal action by the proponent. For these reasons the selection of the No Action Alternative is unlikely, but is described in this document in order to satisfy the requirements under the National Environmental Policy Act (NEPA).

Alternative 3-BLM Mitigation Alternative

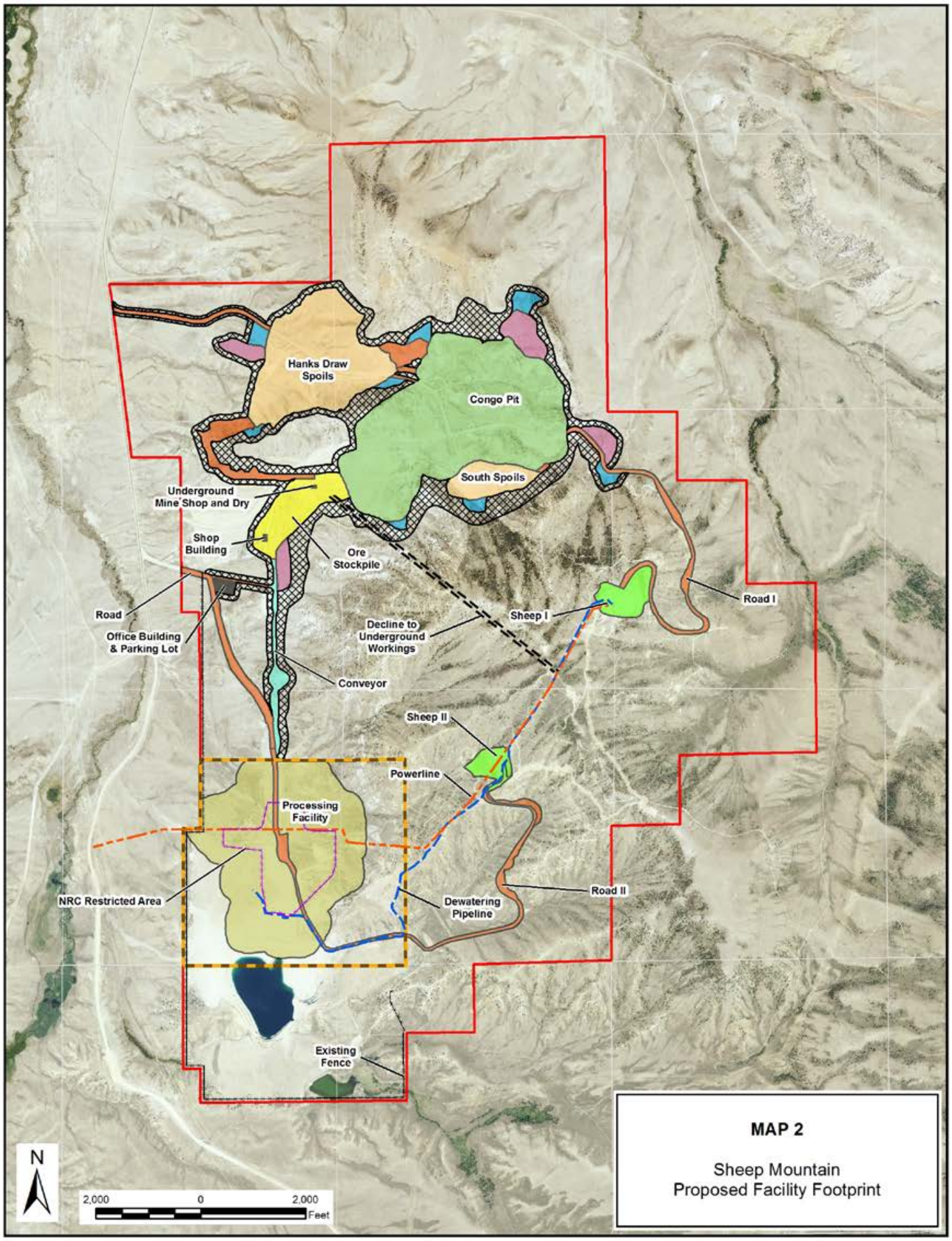
This alternative was developed in response to public and agency input collected during the scoping process in order to potentially reduce the environmental impacts of the Project. This alternative is similar to the Proposed Action Alternative, in that conventional mining techniques would be utilized and uranium would be produced using heap leach and solvent extraction/ion exchange procedures. This alternative would utilize the same processes and take place over the same time period as the Proposed Action but would include changes and mitigation procedures implemented to reduce and/or otherwise offset surface disturbance and potentially limit impacts to human health, safety, and the environment. Changes to the Proposed Action and additional mitigation measures under this alternative would include: revisions to Energy Fuel's proposed reclamation plan and requiring an inventory of existing roads and development of a Travel Management Plan.

1.2 Relationship to Existing Plans and Documents

Available NEPA analyses were used for the air quality assessments for this Project. The following NEPA analyses have been conducted and have relevance, as noted below, to this Project:

Continental Divide – Creston Natural Gas Infill Project Environmental Impact Statement (CD-C) (Ongoing). BP America Production Company, Devon Energy, and other operators propose to develop natural gas resources within the existing Continental Divide, Wamsutter, Creston, and Blue Gap natural gas fields, located in Carbon and Sweetwater counties, Wyoming. The cumulative modeling analysis prepared in support of the FEIS (BLM, 2014b) associated with this project are applicable for addressing cumulative impacts for the Sheep Mountain Project.

Riverton Dome Coal Bed Natural Gas and Conventional Gas Development Project Final Environmental Impact Statement (August 2008). Devon Energy proposed to develop Coal Bed Natural Gas Wells (CBNG) wells and conventional gas wells on existing leases and additional leases approximately 5 miles sourtheast of Riverton on the Wind River Indian Reservation (WRIR), in Fremont County. The air quality analysis prepared for the FEIS analyzed air quality, and AQRVs at several Class I and sensitive Class II areas surrounding the project area (Bureau of Indian Affairs - BIA, 2008). The sensitive Class II area receptors developed for the Riverton Dome study were used for the Sheep Mountain study.



Hanks Draw Spoils
Congo Pit
South Spoils
Underground Mine Shop and Dry
Shop Building
Ore Stockpile
Road
Office Building & Parking Lot
Decline to Underground Workings
Sheep I
Road I
Conveyor
Sheep II
Powerline
Processing Facility
NRC Restricted Area
Dewatering Pipeline
Road II
Existing Fence
N
2,000
0
2,000
Feet
MAP 2
Sheep Mountain
Proposed Facility Footprint

In addition, the Nuclear Regulatory Commission (NRC) has jurisdiction over the heap leach, ponds, and processing facilities within the NRC License Boundary. They will be preparing a separate EIS and will analyze radiological impacts from these sources.

The EPA regulates the radon emissions from uranium byproduct impoundments under 40 CFR Part 61 subpart W, which includes the heap leach and processing ponds. Also, EPA regulates and sets standards on radon emissions from underground uranium mines under 40 CFR Part 61 subpart B.

1.3 Air Quality Assessment Summary

The air quality analysis addresses the impacts on ambient air quality and AQRVs from the potential air emissions from the Sheep Mountain Project. Potential ambient air quality impacts were quantified and compared to applicable state and federal standards, and AQRV impacts (impacts on visibility [regional haze], atmospheric deposition, and potential increases in acidification to acid sensitive lakes) were quantified and compared to applicable thresholds as defined in the Federal Land Managers' (FLMs') Air Quality Related Values Workgroup (FLAG) guidance document (FLAG, 2010), and other state and federal agency guidance. Impact assessment criteria and results of the analysis are discussed in further detail in Section 5.0.

The assessment of impacts included:

- Development of Project construction and production emissions inventory (see Section 2.0).
- Prediction of near-field ambient impacts from Project emissions sources (see Sections 3.0 and 5.1).
- Prediction of far-field impacts from Project emissions sources, including pollutant concentrations, visibility and atmospheric deposition impacts, and potential increases in acidification of acid sensitive lakes at federal Class I and Class II sensitive areas within 200 km of the Project Area (see Sections 4.0 and 5.2).

2.0 PROJECT EMISSIONS

Air pollutant emissions inventories prepared for the Sheep Mountain Project quantify total nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter less than or equal to 10 microns in size (PM_{10}), particulate matter less than or equal to 2.5 microns in size ($PM_{2.5}$), volatile organic compounds (VOCs), and the Hazardous Air Pollutants (HAPs); formaldehyde, benzene, toluene, ethyl benzene, and n-hexane. Lead emissions are negligible and have not been calculated in the inventory.

Methane (CH_4), nitrous oxide (N_2O), and carbon dioxide (CO_2) emissions are also included in the project inventory for purposes of quantifying greenhouse gas (GHG) emissions. Total annual CO_2 equivalent (CO_2e) is calculated in the emissions inventory in Appendix A and reported over the life of the Project in the EIS.

Emissions are calculated from construction and operations as part of the Proposed Action Alternative, with operation emissions calculated for both the on-site and off-site ore processing options. Air emissions from the No Action Alternative and Alternative 3 would be equal to or less than those calculated for the Proposed Action; therefore, no emissions inventories were developed for these alternatives.

The emissions inventory was developed using AP-42 (EPA, 1995), Wyoming Department of Environmental Quality (WDEQ) Air Quality Division (AQD) mining emission factors, and other accepted engineering methods combined with equipment specifications, material throughput, and activity and operating rates provided by the operator. Pollutant emission rates were calculated for both annual and short-term periods of operation, and used as input to model pollutant concentrations with corresponding averaging periods.

Annual emissions calculations utilized activity rates and material throughputs representative of a full year of operation. Twenty-four-hour or daily emission rates were calculated based on maximum 24-hour activity rates and hourly emission rates were calculated based on maximum hourly activity rates. For some sources, annual activity rates were equivalent to the hourly and/or daily rate occurring year-round. For other sources, shorter-term emission rates were higher than the annual rate due to operational considerations; for example, certain mobile sources in the fleet could operate concurrently in a worst-case hour, but annually their operation would be more limited. The calculation of both annual and short-term emission rates is shown in the emissions inventories provided in Appendix A.

The specific components of facility construction and production and emissions calculation methodology for these activities are discussed in the following subsections. Emissions inventories for the Proposed Action construction phase and the two operation options are included as Appendix A.

2.1 Construction Emissions

Emission calculations for construction utilize operator-supplied equipment specifications and operating data. Emissions-generating activities occurring during construction include:

- Underground blasting and construction;
- Mine intake air heaters;
- Surface dozing, overburden removal and overburden unloading (similar to surface mining activity occurring during operation);
- Facilties construction;
- Heavy-duty and light-duty vehicles (unpaved road travel);
- Wind erosion of open acres and stockpiles; and
- Mobile source fuel combustion.

2.2 Operation Emissions

Emissions were calculated for 1) operation with on-site processing and 2) operation with off-site processing occurring at the Sweetwater Mill. Calculations rely on operator-provided specifications and operating and throughput data. While most parameters provided by the operator reflected a maximum rate regardless of year, the tons hauled to each spoils pile location varied by year in the mine plan (Energy Fuels, 2014), and calculation of overburden hauling required an estimate of these tons. Operator-provided projections were reviewed to determine a maximum scenario, and year 3 of the mine plan was selected because it exhibited the highest overburden excavation rate of years during which overburden would be hauled to the spoils piles. All throughputs and operating rates are shown in the inventories contained in Appendix A.

Emissions-generating activities occurring during operation are:

- Underground blasting;
- Mine intake air heaters;
- Primary crushers;
- Conveyor transfers;
- Surface dozing, product removal, overburden removal, and unloading of product and overburden;
- Radial stacker transferring material to leach pad;
- Production facility;
- Unpaved road travel;
- Wind erosion of open acres and stockpiles;
- Mobile source fuel combustion;
- Shop, plant, office heating; and
- Ore haul to off-site processing site at Sweetwater Mill (off-site processing option only).

Emissions for the maximum PM_{10} emissions case, production with off-site processing, are shown in Table 1. The primary criteria pollutants to be emitted at and analyzed for the facility are included in Table 1 (NO_x, CO, PM_{10} and $PM_{2.5}$). The complete emissions inventories for construction and both operation cases and construction are included in Appendix A.

Table 1
Annual Emissions by Activity (tons per year)
Proposed Action - Production with Off-Site Processing

Activity	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Underground Mine Sources				
Blasting	6.35	22.12	0.014	0.0008
Mine Intake Air Heaters	0.05	0.04	0.003	0.0034
Primary Crusher	--	--	0.17	0.02
Coarse ore conveyor transfers	--	--	0.08	0.02
Mobile sources	42.13	44.88	2.55	2.55
Surface Mine Sources				
Dozing	--	--	7.43	3.90
Product removal	--	--	0.33	0.07
Overburden removal	--	--	35.19	7.04
Overburden unloading	--	--	7.58	1.52
Truck dump	--	--	1.88	0.38
Primary Crusher	--	--	0.33	0.05
Overland coarse ore conveyor transfers	--	--	2.41	0.48
Radial stacker to leach pad	--	--	0.73	0.15
Surface facilities heating	0.20	0.17	0.02	0.02
Production facility	0.69	0.48	21.89	3.28
Wind Erosion				
Open acres	--	--	24.62	3.69
Stockpiles	--	--	34.83	5.22
Surface Mobile Sources				
Mine-Wide Unpaved Road Travel	--	--	114.06	11.40
Surface Mobile/Nonroad Sources	151.66	89.09	1.29	1.29
TOTAL	201.08	156.78	254.41	41.08

"- -" means either there are no emissions of that pollutant at all, or there are no emissions of that pollutant accounted for in the line item and are accounted for in mobile source category (for diesel equipment , etc.).

3.0 NEAR-FIELD ANALYSIS

3.1 Modeling Methodology

The near-field ambient air quality impact assessment was performed to quantify maximum pollutant impacts within and near the Project Area resulting from Project-related emissions. Criteria pollutant emissions of PM_{10}, $PM_{2.5}$, NO_x, SO_2, and CO were evaluated as part of the near-field study. Emissions of the HAPs formaldehyde, benzene, toluene, ethylbenzene, and n-hexane are not evaluated given the minimal emissions levels calculated for these pollutants.

Near-field dispersion modeling was conducted for the Proposed Action Alternative. Pollutant emissions from the No Action Alternative and Alternative 3 would be less than the Proposed Action and therefore would produce lower ambient air impacts; the Proposed Action provides the most conservative estimate of maximum annual and short-term near-field impacts.

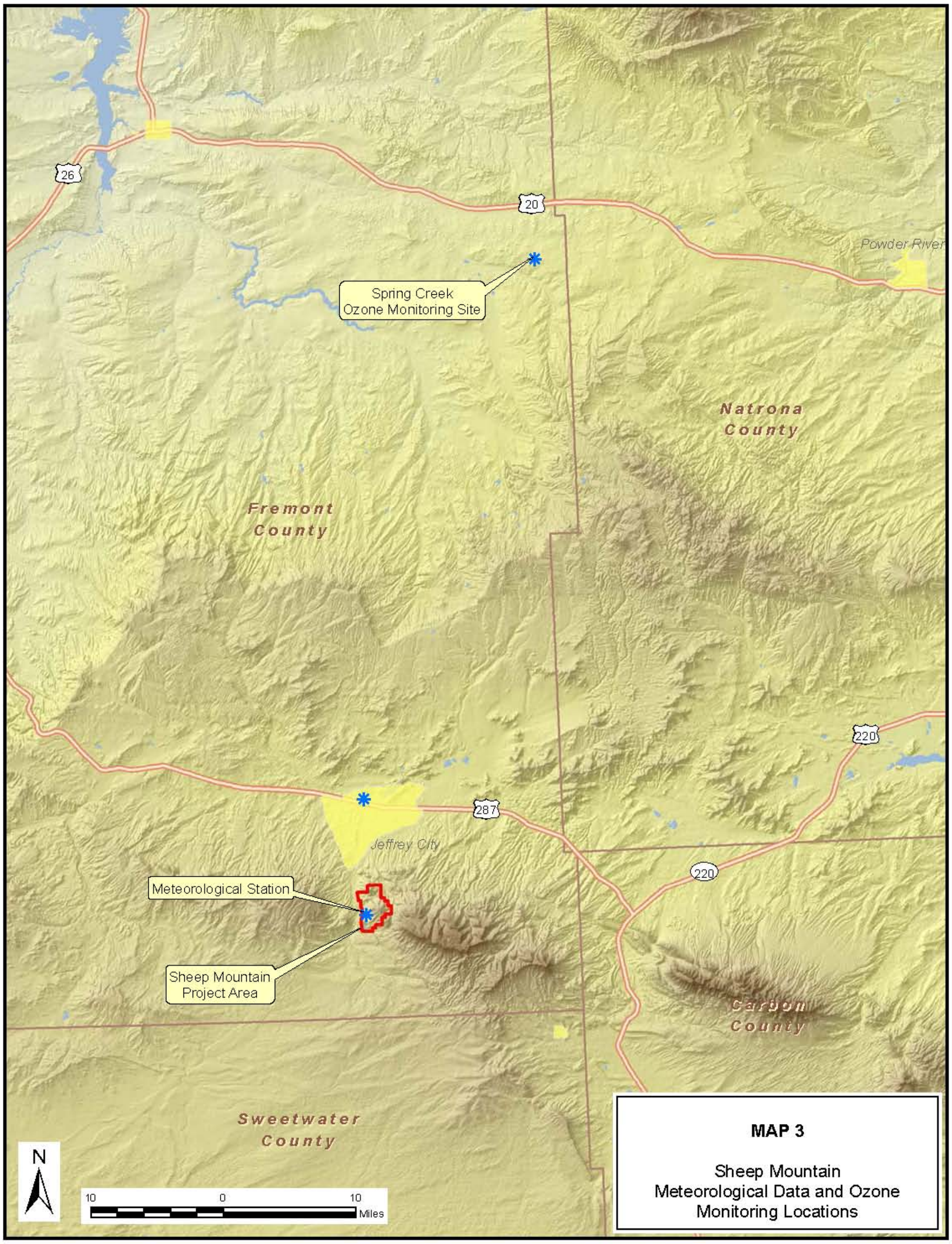
The EPA's Guideline (EPA, 2005) model, AERMOD (Version 13350), was used to assess these near-field impacts. Regulatory model settings was utilized, with the exception of the non-regulatory Ozone Limiting Method (OLM) option, which was used for modeling nitrogen dioxide (NO_2) concentration estimates. Modeling NO_2 utilized hourly ozone concentration data collected at the Spring Creek, Wyoming monitoring station during 2011 and 2012, located 49 miles northeast of the Project Area as shown on Map 3.

Ozone (O_3) formation and impacts were not modeled as part of the air quality assessment, rather a qualitative assessment of the potential contribution to regional ozone formation, based on representative studies in the region (e.g. the CD-C Infill Project Draft EIS), is presented in the EIS document.

3.2 Meteorological Data

Meteorology data collected by Energy Fuels at the Sheep Mountain site is most representative of the meteorological conditions at the site and was used in the near-field analysis. Monitoring at the site began in June 2010. The on-site data include 10 meter level measurements of wind speed, wind direction, standard deviation of wind direction [sigma theta], solar radiation, temperature (10 meter and 2 meter), and temperature difference. The calendar years January 2011 through December 2012 were selected for use in this analysis, the most recent two years of data available. The data meet the 90 percent completeness criteria established by EPA in the “Meteorological Monitoring Guidance for Regulatory Modeling Applications” report (EPA, 2000). The location of the Sheep Mountain on-site meteorological station is shown on Map 3. A wind rose for the on-site station is presented in Figure 1.

The Sheep Mountain meteorological measurements were processed into datasets (surface data and profile data) compatible with the AERMOD dispersion model using the AERMET (Version 13350) meteorological processor. Because temperature difference and solar radiation are collected on-site, AERMET were applied following the Bulk Richardson method switch settings to combine the on-site tower data with twice daily sounding data from the Riverton, Wyoming, National Weather Station (NWS). AERSURFACE (Version 13016) was used to develop twelve sector seasonal surface characteristics for the project area, and these surface characteristics were used in the AERMET processing.



26
20
Powder River
Spring Creek
Ozone Monitoring Site
Natrona
County
Fremont
County
220
287
Jeffrey City
220
Meteorological Station
Sheep Mountain
Project Area
Carbon
County
Sweetwater
County
N
10
0
10
Miles
MAP 3
Sheep Mountain
Meteorological Data and Ozone
Monitoring Locations

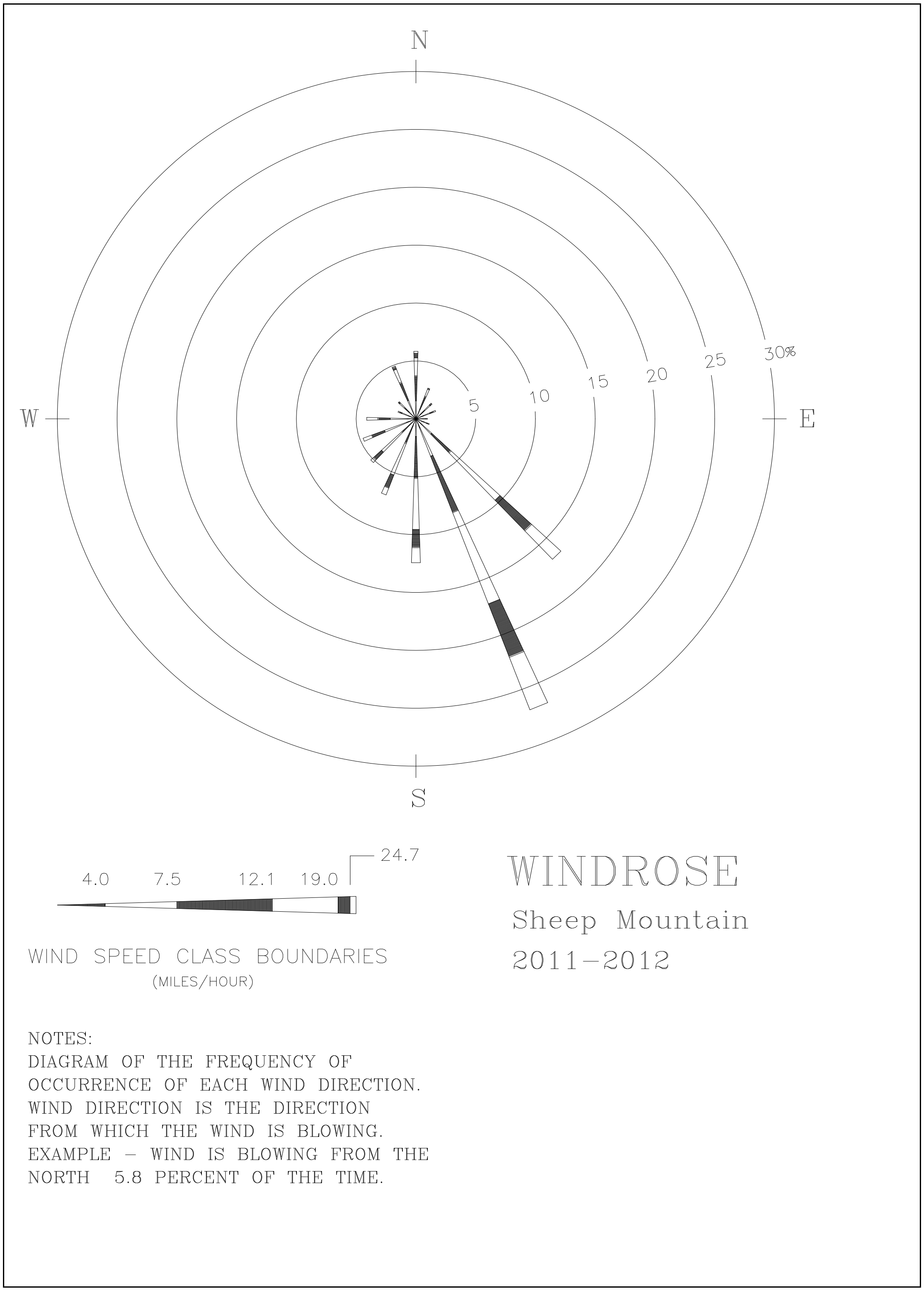


Figure 1
Sheep Mountain Meteorological Data Windrose

3.3 Background Data

Background pollutant concentrations are used as an indicator of existing conditions in the region, and are assumed to include emissions from industrial emission sources in operation and from mobile, urban, biogenic, other non-industrial emission sources, and transport into the region. These background concentrations are added to modeled near-field Project impacts to calculate total ambient air quality impacts. Table 2 presents the background values provided for the region by the WDEQ-AQD (WDEQ, 2014).

Table 2
Near-Field Analysis Background Ambient Air Quality Concentrations

Pollutant	Averaging Period	Measured Background Concentration ($\mu g/m^3$)
Carbon monoxide (CO)[1]	1-hour 8-hour	904 572
Nitrogen dioxide (NO_2)[2]	1-hour Annual	9.4 1.9
PM_{10}[2]	24-hour Annual	49 11
$PM_{2.5}$[3]	24-hour Annual	27 7.0
Sulfur dioxide (SO_2)[1]	1-hour 3-hour	18.3 18.3

[1] Background data collected at Cheyenne, Wyoming during 2012, WDEQ-AQD, 2014.
[2] Background data collected at South Pass, Wyoming during 2012, WDEQ-AQD, 2014.
[3] Background data collected in Rock Springs, Wyoming during 2012, WDEQ-AQD, 2014.

3.4 Criteria Pollutant Modeling

The construction and operation phases of mine life were found to produce maximum pollutant emissions. A near-field criteria pollutant assessment was performed to estimate maximum potential impacts of PM_{10}, $PM_{2.5}$, NO_x, SO_2, and CO from project emission sources active under each modeled construction and production scenario.

A single construction scenario was analyzed, based on a maximum year of construction activity. Two separate production scenarios were analyzed; the on-site processing scenario and the off-site processing scenario. The on-site processing scenario includes all operation activities, with the heap leach and processing operations occurring on-site and within the Project Area boundary. The off-site processing scenario includes the same production activities and emissions, but heap leach and processing would occur off-site at the Sweetwater Mill, and additional unpaved road traffic from the transport of ore off-site was modeled.

Model input for the construction phase, the operations phase with on-site processing, and the operations phase with off-site processing was determined from Energy Fuels-provided field assumptions within the Project Area, and prepared consistent with EPA and WDEQ-AQD guidance. Twenty-four-hour and annual PM_{10} and $PM_{2.5}$ concentrations, 1-hour and annual average NO_2 concentrations, 1-hour and 8-hour CO concentrations, and 1-hour, 3-hour, 24-hour, and annual SO_2 concentrations were predicted. Maximum short-term Project emissions were used for modeling impacts for comparison to short-term air quality standards, with hourly maximum emission rates used for 1-hour, 3-hour, and 8-hour pollutant averaging periods, and 24-hour maximum emissions used for 24-hour pollutant averaging periods. Modeled source configuration and locations within the Project Area for construction, operations with on-site processing , and operations with off-site processing are provided on Maps 4, 5, and 6, respectively.

Point sources were used for modeling emissions from the underground mine exhaust and any stationary sources identified. All point sources were oriented vertically, except for the underground mine exhaust points, Sheep1 and Sheep 2. These exhaust points were horizontal and assumed to be at ambient temperature. Following EPA guidance, the exit velocity was set to a low value and stack diameter increased to conserve the mass of the flow from the vents. Volume sources were used for modeling unpaved road travel and material transfers. Area sources were used to model stockpiles, wind erosion of open acres, and pit activity. Model input parameters for each modeled emissions source and scenario are given in Table 3. The most recent version of the Building Profile Input Program (BPIP-Prime 04274) was used to determine appropriate direction-specific building dimension downwash parameters.

All scenarios include employee transport and bulk delivery truck travel to and from the site on unpaved roads. The production phase off-site processing scenario includes ore haul travel as well. Dispersion modeling includes only the portion of this travel occurring within the ambient air boundary.

As mentioned in Section 3.1, modeling analyses for NO_2 concentration estimates were performed using the OLM methodologies with the AERMOD model. NO_2 modeling utilized hourly ozone concentration data collected at the Spring Creek monitoring station for calendar year 2011-2012. The Spring Creek site is located 49 miles north-northeast of the Project Area, and is the closest representative ozone monitoring station available. These data are concurrent with the 2011-2012 Sheep Mountain meteorological data used in the analysis. A value of 20 percent was used for all source in-stack NO_2 concentration estimates. This value is a conservative estimate supported by data from EPA's NO_2/NO_x In-Stack Ratio (ISR) Database (EPA, 2013) and from the California Air Pollution Control Officers Association (CAPCOA) "Modeling Compliance of the Federal 1-Hour NO_2 NAAQS" Guidance Document (CAPCOA, 2011).

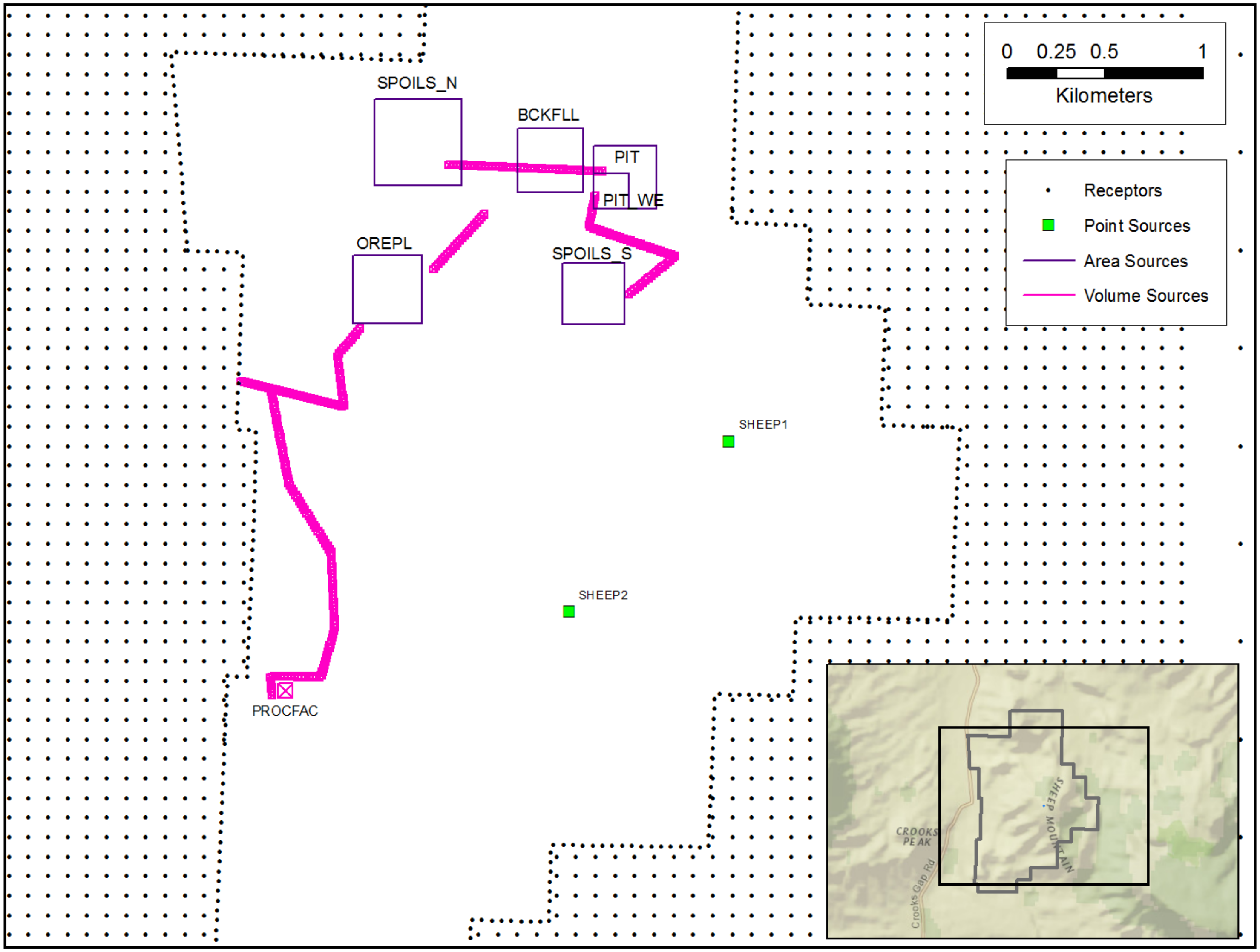
Discrete model receptors were developed in accordance with current WDEQ-AQD modeling guidance (WDEQ, 2010), at locations at and beyond the ambient air boundary. The area within the ambient air boundary is not accessible to the public. Discrete modeling receptors were placed at a minimum of 50-meter intervals along the ambient air boundary, at 100-meter spacing to a distance of 1 kilometer from the facility, and at 500-meter spacing to a distance of 5 kilometers from the facility. Map 7 illustrates receptor locations utilized for the area around the primary mine site for all construction and operations, and the additional model receptors utililized for the off-site processing are shown in Map 8.

Terrain heights for each receptor and source were assigned following EPA guidance, and using the AERMAP (Version 11103) terrain processor. Digital elevation data from the National Elevation Dataset (NED) at a 10-meter resolution were used in conjunction with this processor to assign elevations in meters above sea level to receptors and sources.

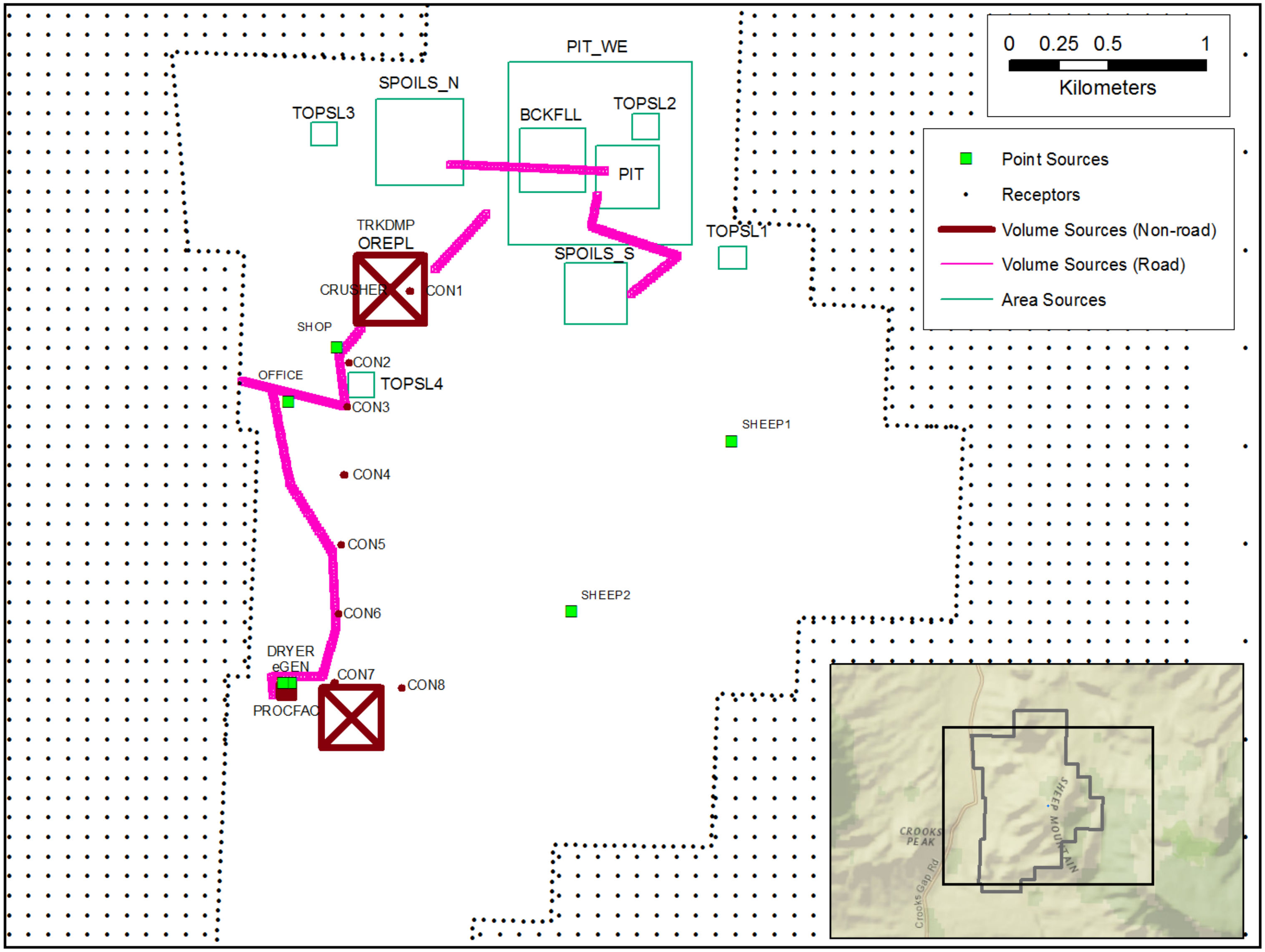
Table 3
Modeled Emissions Source Input Parameters

Type	Model ID	Description	Height (m)	Temp (K)	Velocity (m/s)	Diameter (m)	X Init (m)	Y Init (m)	Angle (deg)	Sigma-y Init (m)	Sz Init (m)
Point	DRYER	Uranium Dryer	10.00	366.48	72.53	0.30					
Point	EMERGEN	Emergency Generator	10.00	800.00	40.00	0.10					
Point	OFFICE	Office Heating	10.00	350.00	20.00	0.10					
Point	SHOP	Shop Heating	10.00	350.00	20.00	0.10					
Point	PROC	Process Building Heating	10.00	350.00	20.00	0.10					
Point	SHEEP1	Underground Mine Exhaust	1.25	0.00	0.01	115.87					
Point	SHEEP2	Underground Mine Exhaust	1.25	0.00	0.01	115.87					
Area	PIT	Mechanical Fugitives At Pit	10.00				325.23	322.89	0.00		4.65
Area	BCKFLL	Mechanical Fugitives From Backfill	10.00				332.25	322.89	0.00		4.65
Area	SPOILS_N	Mechanical Fugitives At Spoils	10.00				446.90	442.23	0.00		4.65
Area	SPOILS_S	Mechanical Fugitives At Spoils	10.00				316.35	314.70	0.00		4.65
Area	OREPL	Wind Erosion At Ore Pile	5.00				351.00	351.00	0.00		2.33
Area	TOPSL(1-4)	Wind Erosion At Topsoil Pile	5.00				138.05	116.99	0.00		2.33
Area	PIT_WE	Wind Erosion At Pit	5.00				935.00	935.00	0.00		2.33
Area	SPOILS_NWE	Wind Erosion At Spoils	5.00				446.90	442.23	0.00		2.33
Area	SPOILS_SWE	Wind Erosion At Spoils	5.00				316.35	314.70	0.00		2.33

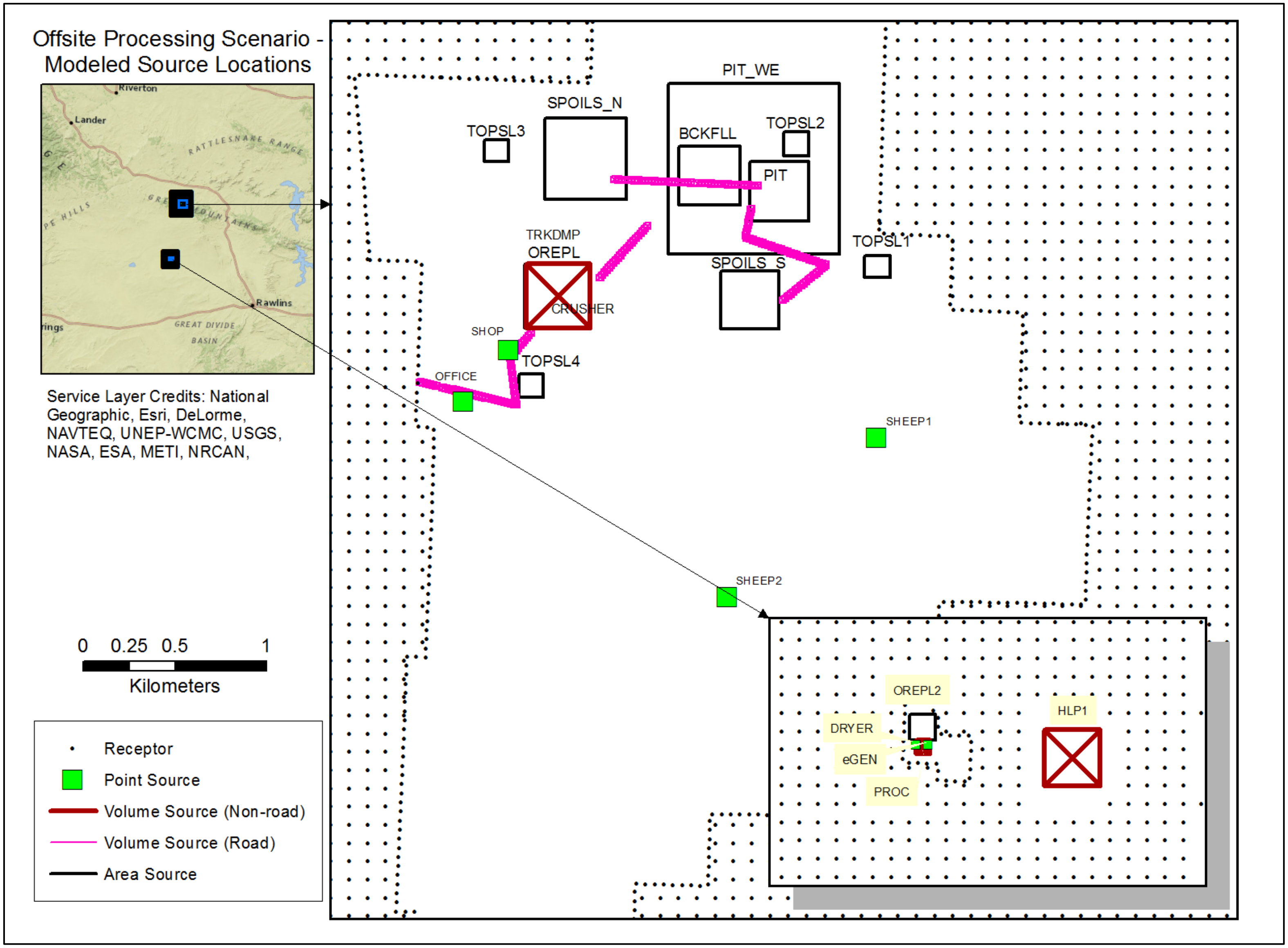
Type	Model ID	Description	Height (m)	Temp (K)	Velocity (m/s)	Diameter (m)	X Init (m)	Y Init (m)	Angle (deg)	Sigma-y Init (m)	Sz Init (m)
Area	PIT_MOB	Tailpipe Emissions At Pit	10.00				325.23	322.89	0.00		4.65
Area	BCKFLL_MOB	Tailpipe Emissions At Backfill	10.00				332.25	322.89	0.00		4.65
Area	SPOILN_MOB	Tailpipe Emission At Spoils	10.00				446.90	442.23	0.00		4.65
Area	SPOILS_MOB	Tailpipe Emission At Spoils	10.00				316.35	314.70	0.00		4.65
Area	OREPL_MOB	Tailpipe Emissions At Ore Pile	10.00				351.00	351.00	0.00		4.65
Volume	HLP1	Heap Leach Pad	4.57							71.16	4.25
Volume	CRUSHER	Crusher	2.50							4.65	2.33
Volume	TRKDMP	Truck Dump	2.50							81.63	2.33
Volume	CONV(1-8)	Conveyor Transfers	6.25							1.16	0.07
Volume	PRODFAC	Production Facility	2.50							17.88	2.33
Volume	RADSTK	Radial Stacker	10.27							0.21	0.06
Volume	HAUL	Haul Roads	5.10							8.46	4.74



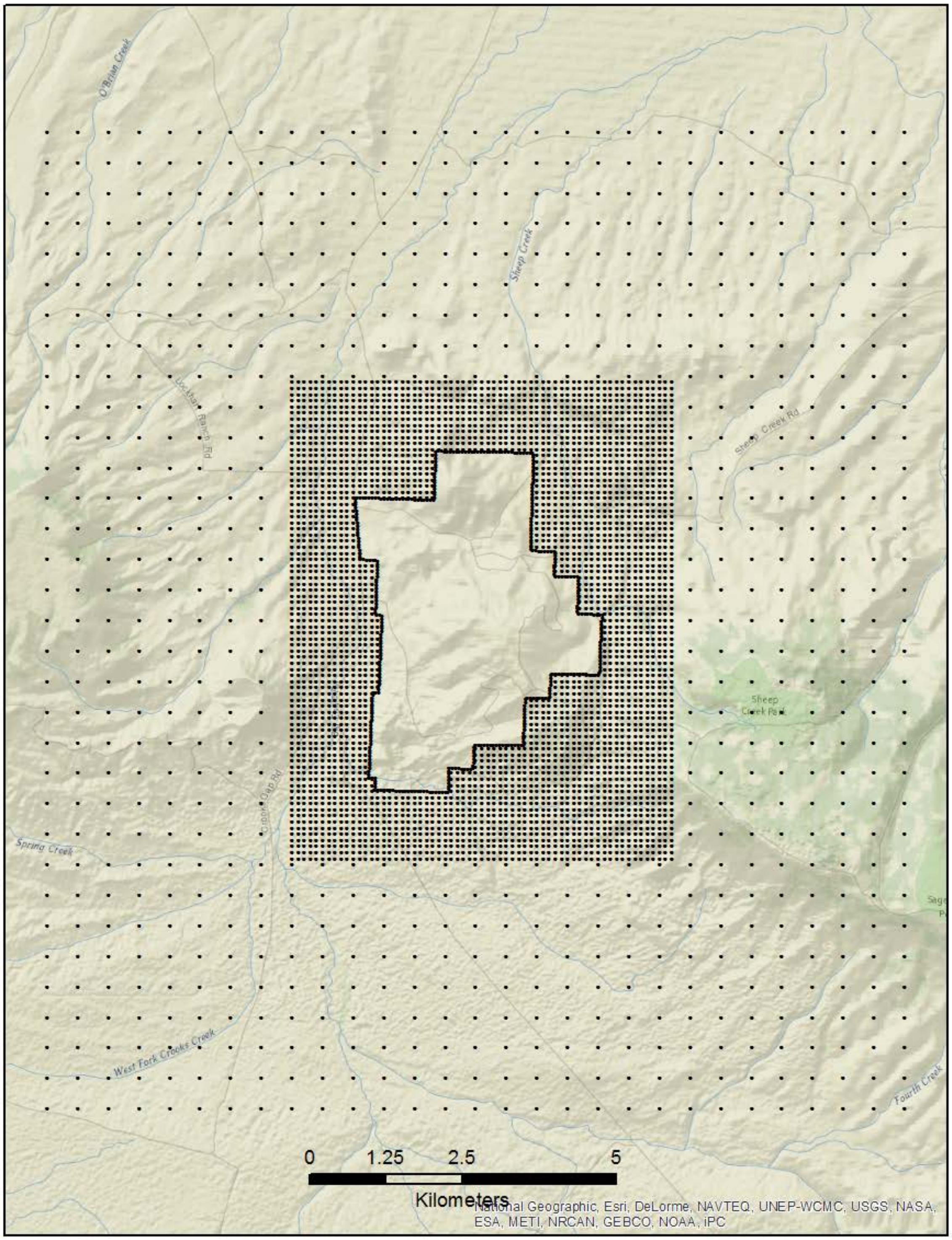
Map 4
Modeled Source Locations – Construction Scenario



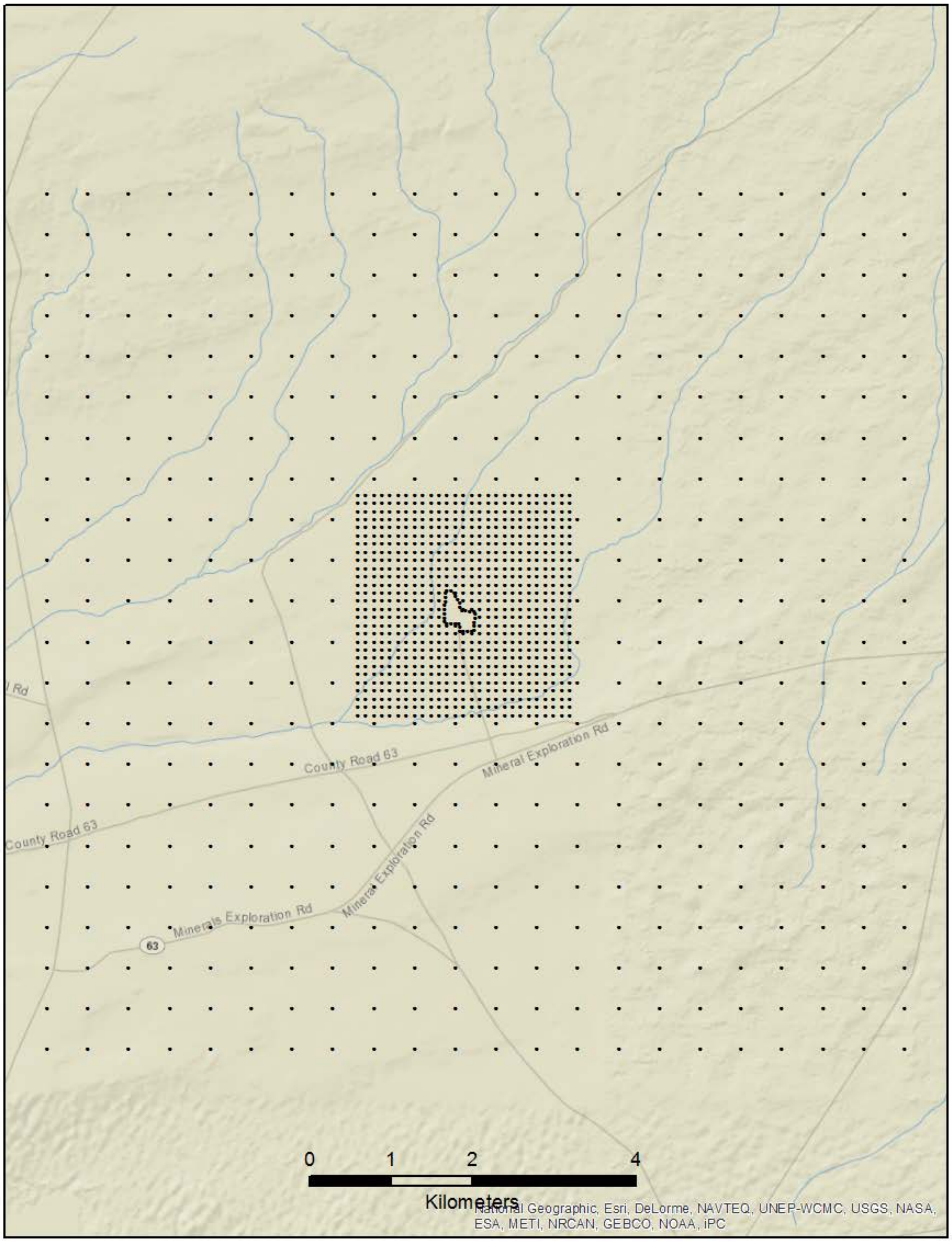
Map 5
Modeled Source Locations – On-Site Processing Scenario



Map 6
Modeled Source Locations – Off-Site Processing Scenario



Map 7
Dispersion Model Receptors – Construction, On-Site and Off-Site Processing Scenarios at the Primary Site



Map 8
Dispersion Model Receptors – Additional Receptors for the Off-Site Processing Scenario

4.0 FAR-FIELD ANALYSIS

The purpose of the far-field analysis is to quantify potential air quality impacts to both ambient air concentrations and AQRVs from air pollutant emissions of NO_x, SO_2, PM_{10} and $PM_{2.5}$ expected to result from construction and operation of the Proposed Action and alternatives. Ambient air quality impacts of NO_2, SO_2, PM_{10}, and $PM_{2.5}$, and AQRVs were analyzed at federal Class I and sensitive Class II areas that are within 200 km of the Project Area. The analyses were performed using the EPA-approved version of the CALPUFF modeling system (Version 5.8.4) with the exception of the use of Mesoscale Model Interface Program (MMIF) Version 3.0 (ENVIRON, 2013) to develop a meteorological windfield rather than CALMET. All CALPUFF model options conform to the 2009 EPA guidance (EPA, 2009) and all CALPOST model options and inputs conform to FLAG 2010 guidance (FLAG, 2010). Maximum Project emissions, described in Section 2.0, were modeled for the far-field analysis. Sources were placed at the same locations used in the near-field analysis as presented in Maps 4 through 6.

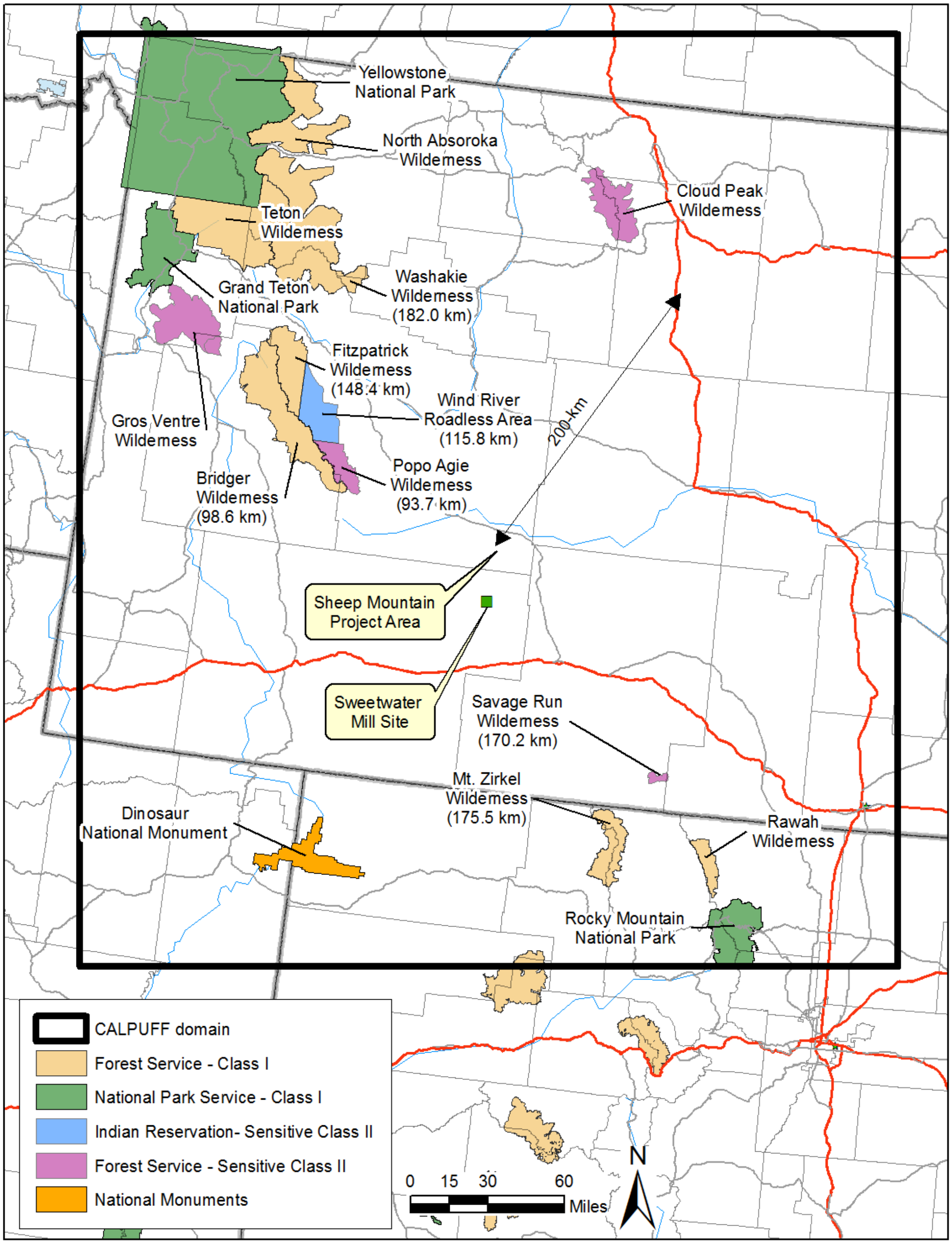
The federal Class I and sensitive Class II areas located within 200 km of the Project Area are listed in Table 4. Table 4 also lists the agency responsible for managing the area, and the PSD classification. Map 9 indicates the proposed CALPUFF modeling domain and shows the Class I and sensitive Class II areas within 200 km of the Project Area. As shown in Map 9, the Project is approximately 94 km from the nearest sensitive area (Class II Popo Agie Wilderness Area).

The receptors for the Class I areas were obtained the FLM receptor database. The receptors for sensitive Class II areas were obtained from prior CALPUFF air quality analyses, i.e. the Riverton Dome EIS (BIA, 2008).

Table 4
Class I and Sensitive Class II Areas

Area of Concern	Managing Agency	PSD Classification
Bridger Wilderness Area	US Forest Service	I
Fitzpatrick Wilderness Area	US Forest Service	I
Mount Zirkel Wilderness Area	US Forest Service	I
Washakie Wilderness Area	US Forest Service	I
Popo Agie Wilderness Area	US Forest Service	II
Savage Run Wilderness Area	US Forest Service	II
Wind River Roadless Area	Bureau of Indian Affairs	II

Ambient air impacts of NO_2, SO_2, PM_{10}, $PM_{2.5}$ and AQRVs (visibility and acid deposition) were analyzed at the each of the Class I and sensitive Class II areas. In addition, ten lakes that are designated as acid sensitive were assessed for potential lake acidification from atmospheric deposition impacts. These include Black Joe, Deep, Hobbs, Lazy Boy, and Upper Frozen lakes in the Bridger Wilderness; Ross Lake in the Fitzpatrick Wilderness; Lake Elbert, Seven Lakes, and Summit Lake in the Mount Zirkel Wilderness; and Lower Saddlebag Lake in the Popo Agie Wilderness.



Map 9
CALPUFF Modeling Domain and Class I and Sensitive Class II Areas within 200km of the Sheep Mountain Project Area

The CALPUFF-predicted concentration impacts were compared with ambient air quality standards and Class I and II Increments, and post-processed to compute: (1) AQRV impacts due to light extinction change for comparison to visibility impact thresholds in Class I and sensitive Class II areas; and (2) AQRV impacts due to deposition rates for comparison to sulfur (S) and nitrogen (N) deposition thresholds, and to calculate change in acid neutralizing capacity (ANC) for sensitive water bodies.

4.1 Meteorological data

The 2008 Weather Research and Forecasting (WRF) meteorological model output produced as part of the Western Regional Air Partnership's (WRAP) West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) (ENVIRON et. al., 2012) were used as the meteorological dataset for input into the CALPUFF modeling. The WestJumpAQMS WRF model was run for an extensive 4 km domain that focuses on the intermountain West, including the Project location and surrounding areas.

A subset of the WestJumpAQMS modeling output were extracted for the air quality modeling domain and processed into CALPUFF-ready format using the MMIF meteorological preprocessor. The PSD Class I and sensitive Class II areas within 200 km of the Project were contained within the modeling domain along with with sufficient buffer for potential recirculation effects.

The WRF model output was processed with MMIF with the following options selected:

- Output for CALPUFF version 5.8.4;
- The WRF vertical layers were interpolated to the FLM/EPA-recommended vertical layers using the TOP option;
- The PG stability classes were calculated with the Golder option; and
- Planetary boundary layer heights were recalculated.

This resulted in the CALPUFF-ready meteorological files with the following specifications:

- Projection of LCC with RLAT0 = 40N, RLON0 = 97W, XLAT1 = 33N and XLAT2 = 45N;
- Datum = NWS-84;
- NX =130;
- NY =148;
- NZ =10;
- DGRIDKM = 4.; and
- ZFACE = 0., 20., 40., 80., 160., 320., 640., 1200., 2000., 3000., 4000.

The MMIF output, for the entire year of 2008, was consistent with both the original WRF model output and EPA-recommended settings as applicable.

4.2 Ozone and Ammonia Data

Representative ozone and ammonia data is required for use in the chemical transformation of primary pollutant emissions. Hourly ozone is used by CALPUFF to oxidize NO_X and SO_2 emissions within the modeling domain to nitric acid and sulfuric acid, respectively. The predicted nitric acid and sulfuric acid are then partitioned in CALPUFF between the gaseous and particulate nitrate and sulfate phases based on the available ammonia, and ambient temperature and relative humidity.

Hourly ozone data from EPA Air Quality System (AQS) and Clean Air Status and Trends Network (CASTNET) ozone sites within the modeling domain was used in the analysis.

The background ammonia value used in the CALPUFF modeling was 1.0 parts per billion (ppb) for each month of the year following FLAG 2010 guidance for arid lands.

4.3 Visibility

CALPUFF predicted 24-hour concentrations of nitrate, sulfate, PM_{10} and $PM_{2.5}$ at each of the analyzed Class I and sensitive Class II areas were processed using CALPOST following the procedures described in the FLAG 2010 document to estimate potential change in light extinction. Analyses were conducted using the methodology recommended in the FLAG 2010 report for the 20^{th} percentile best natural visibility conditions. Applicable background visibility data and monthly relative humidity factors used in the calculations are defined in the FLAG report. Natural background and relative humidity factors are available for the Class I Bridger, Fitzpatrick, Washakie, and Mount Zirkel Wilderness Areas only. For the Popo Agie and Wind River Roadless sensitive Class II areas the data for the Bridger Wilderness Area were used. For the Savage Run Wilderness, the data for the Mount Zirkel Wilderness Area were used.

4.4 Deposition

The POSTUTIL and CALPOST processor were used to determine annual deposition of total S and total N from CALPUFF modeled deposition results at each Class I and sensitive Class II area. The results were expressed in kilograms per hectare per year (kg/ha-yr).

4.5 Lake Chemistry

CALPUFF modeled annual N and S deposition impacts at sensitive lake locations were used to estimate changes in ANC. The changes in ANC were calculated following the January 2000, U.S. Forest Service (Forest Service) Rocky Mountain Region's *Screening Methodology for Calculating ANC Change to High Elevation Lakes, User's Guide* (Forest Service, 2000). The most recent lake chemistry background ANC data available from the Forest Service for the ten sensitive lakes listed in Section 4.0 are shown in Table 5. The 10th percentile lowest ANC values were calculated for each lake following procedures provided by the Forest Service. Of the ten lakes listed in Table 5, two lakes (Lazy Boy and Upper Frozen) are considered by the Forest Service as extremely sensitive to atmospheric deposition because the background ANC values are less than 25 microequivalents per liter (µeq/l). Annual precipitation data for each lake were obtained from the Parameter-elevation Regressions on Independent Slopes Model (PRISM) (PRISM, 2014) climate mapping system data base, and these precipitation values were used in the calculation of ANC changes.

Table 5
Background ANC Values for Acid Sensitive Lakes[1]

Wilderness Area	Lake	Latitude (Degs)	Longitude (Degs)	10th Percentile Lowest ANC Value (µeq/l)[2]	Number of Samples	Monitoring Period
Bridger	Black Joe	42.739	109.171	62.6	78	1984-2009
Bridger	Deep	42.719	109.172	57.7	68	1984-2009
Bridger	Hobbs	43.035	109.673	69.9	80	1984-2009
Bridger	Lazy Boy	43.332	109.729	9.1	5	1997-2009
Bridger	Upper Frozen	42.687	109.161	7.5	12	1997-2009
Fitzpatrick	Ross	43.393	109.658	53.0	61	1988-2010
Mount Zirkel	Lake Elbert	40.634	106.707	56.9	68	1985-2007
Mount Zirkel	Seven Lakes (LG East)	40.896	106.682	36.2	67	1985-2007
Mount Zirkel	Summit Lake	40.545	106.682	48.0	107	1985-2007
Popo Agie	Lower Saddlebag	42.623	108.995	54.6	64	1989-2010

[1] Source: Forest Service, 2014.
[2] 10th Percentile Lowest ANC Values reported.

5.0 AIR QUALITY IMPACTS

5.1 Near-Field

5.1.1 Criteria Pollutant Impacts

Near-field modeling for criteria pollutants PM_{10}, $PM_{2.5}$, NO_x, and CO was performed for: construction, operations with on-site processing, and operations with off-site processing. The results of this modeling is presented in this section.

Wyoming Ambient Air Quality Standards (WAAQS), National Ambient Air Quality Standards (NAAQS), and applicable PSD Class II increments are shown in Table 6. Near-field modeled concentrations are combined with ambient air quality background concentrations shown in Table 2 and compared to the corresponding NAAQS and WAAQS in the equivalent form of the standard and equivalent units.

Maximum predicted pollutant concentrations from Project emissions sources combined with existing ambient air quality background concentrations and compared to the NAAQS and WAAQS as shown in Table 7 for construction; Table 8 for operations with on-site processing; and Table 9 for operations with off-site processing. All total predicted concentrations were found to be below applicable NAAQS and WAAQS.

Project-only impacts for the operations are compared to PSD Class II increments and are shown in Table 10 for on-site processing and Table 11 for off-site processing. The impacts from construction activities were not compared to PSD increments because construction actvitites are temporary sources and would not consume PSD increment. The predicted pollutant concentrations from stationary sources were found to be below PSD Class II Increments. Predicted impacts from all sources, including both stationary and fugitive sources, were found to be below PSD Class II Increments with the exception of the 24-hour averaging period for PM_{10} and $PM_{2.5}$. Under the operations with on-site processing case, 24-hour PM_{10} concentrations from both stationary and fugitive sources were 11 percent above the PM_{10} 24-hour PSD Class II Increment and 61 percent above the $PM_{2.5}$ 24-hour PSD Class II Increment. Under the operations with off-site processing case, 24-hour PM_{10} concentrations from both stationary and fugitive sources were 77 percent above the 24-hour PM_{10} PSD Class II Increment and 35 percent above the 24-hour $PM_{2.5}$ PSD Class II Increment. This PSD demonstration is for information only and is not a regulatory PSD Increment consumption analysis, which would be completed as necessary during the WDEQ permitting process. The 24-hour PM_{10} and $PM_{2.5}$ impacts are controlled by fugitive sources such as the mining pit and roads associated with operations.

Table 6
NAAQS, WAAQS, and PSD Class II Increments for Comparison to Analysis Results ($\mu g/m^3$)[1]

Pollutant/Averaging Time	NAAQS	WAAQS	PSD Class I Increment[1]	PSD Class II Increment[2]
CO				
1-hour[3]	40,000	40,000	--[4]	--[4]
8-hour[3]	10,000	10,000	--[4]	--[4]
NO_2				
1-hour[5]	188	188	--[4]	--[4]
Annual[6]	100	100	2.5	25
PM_{10}				
24-hour[3]	150	150	8	30
Annual[6]	--[7]	50	4	17
$PM_{2.5}$				
24-hour[8]	35	35	2	9
Annual[6]	12	15[9]	1	4
SO_2				
1-hour[10]	196	196	--[4]	--[4]
3-hour[3]	1,300	1,300	25	512
24-hour[3]	--[7]	--[11]	5	91
Annual[6]	--[7]	--[11]	2	20

[1] For gaseous pollutants, NAAQS and WAAQS conversion from ppm or ppb was performed assuming standard conditions (25 degs C and 29.92 inches Hg).
[2] The PSD demonstrations serve information purposes only and do not constitute a regulatory PSD increment consumption analysis.
[3] No more than one exceedance per year.
[4] No PSD increments have been established for this pollutant–averaging time.
[5] An area is in compliance with the standard if the 98th percentile of daily maximum 1-hour NO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[6] Annual arithmetic mean.
[7] The NAAQS for this averaging time for this pollutant has been revoked by EPA.
[8] An area is in compliance with the standard if the maximum 24-hour PM2.5 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[9] The EPA revised the NAAQS for this pollutant (effective March 18 2013) and the WDEQ has not yet adopted the revised NAAQS as part of their rulemaking. All compliance demonstrations of modeled concentrations will use the more stringent NAAQS value.
[10] An area is in compliance with the standard if the 99th percentile of daily maximum 1-hour SO_2 concentrations in a year, averaged over 3 years, is less than or equal to the level of the standard.
[11] No standards are established for this pollutant-averaging time.

Table 7
Construction - Near-Field Criteria Pollutant Concentrations Compared to NAAQS and WAAQS

Pollutant	Averaging Period	Predicted Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	WAAQS ($\mu g/m^3$)	Percent of NAAQS
CO	1-hour [1]	1048.1	904.0	1952.1	40,000	40,000	5
	8-hour [1]	266.7	572.0	838.7	10,000	10,000	8
NO_2	1-hour [2]	170.2	9.4	179.6	188	188	96
	Annual	10.5	1.9	12.4	100	100	12
PM_{10}	24-hour [1]	47.5	49.0	96.5	150	150	64
	Annual	2.1	11.0	13.1	n/a	50	n/a
$PM_{2.5}$	24-hour [3]	5.3	27.0	32.3	35	35	92
	Annual	0.4	7.0	7.4	12	15	62
SO_2	1-hour [4]	6.3	18.3	24.6	196	196	13
	3-hour [1]	5.0	18.3	23.3	1,300	1,300	2

[1] Highest second-high value.
[2] Two-year average of the 98th percentile daily maximum 1-hour concentrations.
[3] Maximum 98th percentile concentration.
[4] Maximum 99th percentile daily maximum concentration.

Table 8
On-Site Processing - Near-Field Criteria Pollutant Concentrations Compared to NAAQS and WAAQS

Pollutant	Averaging Period	Predicted Impact ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	WAAQS ($\mu g/m^3$)	Percent of NAAQS
CO	1-hour [1]	1048.1	904.0	1952.1	40,000	40,000	5
	8-hour [1]	159.4	572.0	731.4	10,000	10,000	7
NO_2	1-hour [2]	137.9	9.4	147.3	188	188	78
	Annual	8.0	1.9	9.9	100	100	10
PM_{10}	24-hour [1]	33.4	49.0	82.4	150	150	55
	Annual	4.9	11.0	15.9	n/a	50	n/a
$PM_{2.5}$	24-hour [3]	4.3	27.0	31.4	35	35	90
	Annual	0.7	7.0	7.7	12	15	64
SO_2	1-hour [4]	6.3	18.3	24.6	196	196	13
	3-hour [1]	3.3	18.3	21.6	1,300	1,300	2

[1] Highest second-high value.
[2] Two-year average of the 98th percentile daily maximum 1-hour concentrations.
[3] Maximum 98th percentile concentration.
[4] Maximum 99th percentile daily maximum concentration.

Table 9
Off-Site Processing - Near-Field Criteria
Pollutant Concentrations Compared to NAAQS and WAAQS

Pollutant	Averaging Period	Predicted Impact (μg/m³)	Background (μg/m³)	Total Impact (μg/m³)	NAAQS (μg/m³)	WAAQS (μg/m³)	Percent of NAAQS
CO	1-hour [1]	1069.0	904.0	1973.0	40,000	40,000	5
	8-hour [1]	185.5	572.0	757.5	10,000	10,000	8
NO_2	1-hour [2]	145.2	9.4	154.6	188	188	82
	Annual	8.6	1.9	10.5	100	100	11
PM_{10}	24-hour [1]	53.0	49.0	102.0	150	150	68
	Annual	12.3	11.0	23.3	n/a	50	n/a
$PM_{2.5}$	24-hour [3]	5.7	27.0	32.7	35	35	93
	Annual	1.3	7.0	8.3	12	15	69
SO_2	1-hour [4]	9.3	18.3	27.6	196	196	14
	3-hour [1]	7.6	18.3	25.9	1,300	1,300	2

[1] Highest second-high value.
[2] Two-year average of the 98th percentile daily maximum 1-hour concentrations.
[3] Maximum 98th percentile concentration.
[4] Maximum 99th percentile daily maximum concentration.

Table 10
On-Site Processing - Near-Field Criteria Pollutant
Concentrations Compared to PSD Class II Increments

Pollutant	Averaging Period	Predicted Impact (μg/m³)	Class II Increment (μg/m³)	Percent of Increment
NO_2	Annual [1]	8.0	25	32
PM_{10}	24-hour [1]	33.4	30	111
	Annual	4.9	17	29
$PM_{2.5}$	24-hour [1]	14.5	9	161
	Annual	0.7	4	18
SO_2	3-hour [1]	3.3	512	1
	24-hour [1]	1.1	91	1
	Annual	0.03	20	0.1

[1] Highest second high value.

Table 11
Off-Site Processing - Near-Field Criteria Pollutant Concentrations Compared to PSD Class II Increments

Pollutant	Averaging Period	Predicted Impact ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)	Percent of Increment
NO_2	Annual [1]	8.6	25	34
PM_{10}	24-hour [1]	53.0	30	177
	Annual	12.3	17	72
$PM_{2.5}$	24-hour [1]	12.1	9	135
	Annual	1.3	4	32
SO_2	3-hour [1]	7.6	512	1
	24-hour [1]	3.1	91	3
	Annual	0.03	20	0.1
[1] Highest second high value.				

5.2 Far-Field

5.2.1 Ambient Concentration Impacts

Modeled direct project pollutant concentrations predicted to occur at the nearby PSD Class I and Sensitive Class II areas are compared to PSD Increments in Table 12 through 14 for construction, operations with on-site processing, and operations off-site processing, respectively. Although construction activities are temporary sources and would not consume increment, for informational purposes, the comparison of modeled construction impacts to PSD increments is provided in Table 12.

For all modeling scenarios air quality concentration impacts are well below the applicable PSD Increments at each of the PSD Class I and Sensitive Class II areas analyzed. The PSD demonstrations are for information only and are not regulatory PSD Increment consumption analyses, which would be completed as necessary by the WDEQ.

Table 12
Construction - Far-Field Criteria Pollutant Impacts Compared to PSD Increments

Location	Pollutant	Averaging Time	Direct Modeled ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)
Bridger WA	NO_2	Annual	1.86E-04	2.5
	SO_2	3-hour 24-hour Annual	7.39E-03 9.46E-04 5.77E-06	25 5 2
	PM_{10}	24-hour Annual	1.27E-02 2.65E-04	8 4
	$PM_{2.5}$	24-hour Annual	7.75E-03 1.43E-04	2 1
Fitzpatrick WA	NO_2	Annual	1.46E-05	2.5
	SO_2	3-hour 24-hour Annual	1.73E-04 3.87E-05 7.58E-07	25 5 2
	PM_{10}	24-hour Annual	8.48E-03 1.06E-04	8 4
	$PM_{2.5}$	24-hour Annual	6.00E-03 6.71E-05	2 1
Mount Zirkel WA	NO_2	Annual	1.51E-04	2.5
	SO_2	3-hour 24-hour Annual	1.94E-03 2.44E-04 3.87E-06	25 5 2
	PM_{10}	24-hour Annual	1.14E-02 3.74E-04	8 4
	$PM_{2.5}$	24-hour Annual	8.29E-03 2.47E-04	2 1
Washakie WA	NO_2	Annual	9.03E-06	2.5
	SO_2	3-hour 24-hour Annual	9.64E-05 6.90E-05 8.73E-07	25 5 2
	PM_{10}	24-hour Annual	1.81E-02 1.52E-04	8 4
	$PM_{2.5}$	24-hour Annual	1.21E-02 9.67E-05	2 1
Popo Agie WA	NO_2	Annual	2.41E-04	2.5
	SO_2	3-hour 24-hour Annual	1.16E-02 1.48E-03 7.39E-06	25 5 2
	PM_{10}	24-hour Annual	1.83E-02 3.17E-04	8 4
	$PM_{2.5}$	24-hour Annual	8.49E-03 1.68E-04	2 1
Savage Run WA	NO_2	Annual	2.21E-04	25
	SO_2	3-hour 24-hour Annual	6.81E-03 8.57E-04 6.24E-06	512 91 20
	PM_{10}	24-hour Annual	2.99E-02 5.14E-04	30 17
	$PM_{2.5}$	24-hour Annual	2.67E-02 3.46E-04	9 4
Wind River RA	NO_2	Annual	3.84E-05	25
	SO_2	3-hour 24-hour Annual	3.31E-04 6.61E-05 1.64E-06	512 91 20
	PM_{10}	24-hour Annual	9.32E-03 1.86E-04	30 17
	$PM_{2.5}$	24-hour Annual	6.60E-03 1.08E-04	9 4

Table 13
On-Site Processing - Far-Field Criteria Pollutant Impacts Compared to PSD Increments

Location	Pollutant	Averaging Time	Direct Modeled (μg/m^3)	PSD Increment (μg/m^3)
Bridger WA	NO_2	Annual	1.86E-04	2.5
	SO_2	3-hour 24-hour Annual	7.39E-03 9.46E-04 5.78E-06	25 5 2
	PM_{10}	24-hour Annual	2.37E-02 4.34E-04	8 4
	$PM_{2.5}$	24-hour Annual	7.96E-03 1.72E-04	2 1
Fitzpatrick WA	NO_2	Annual	1.47E-05	2.5
	SO_2	3-hour 24-hour Annual	1.73E-04 3.89E-05 7.62E-07	25 5 2
	PM_{10}	24-hour Annual	1.15E-02 1.54E-04	8 4
	$PM_{2.5}$	24-hour Annual	6.55E-03 7.59E-05	2 1
Mount Zirkel WA	NO_2	Annual	1.51E-04	2.5
	SO_2	3-hour 24-hour Annual	1.94E-03 2.44E-04 3.88E-06	25 5 2
	PM_{10}	24-hour Annual	1.54E-02 5.26E-04	8 4
	$PM_{2.5}$	24-hour Annual	8.84E-03 2.73E-04	2 1
Washakie WA	NO_2	Annual	9.04E-06	2.5
	SO_2	3-hour 24-hour Annual	9.69E-05 6.93E-05 8.78E-07	25 5 2
	PM_{10}	24-hour Annual	2.49E-02 2.17E-04	8 4
	$PM_{2.5}$	24-hour Annual	1.33E-02 1.08E-04	2 1
Popo Agie WA	NO_2	Annual	2.41E-04	2.5
	SO_2	3-hour 24-hour Annual	1.16E-02 1.48E-03 7.40E-06	25 5 2
	PM_{10}	24-hour Annual	3.81E-02 5.60E-04	8 4
	$PM_{2.5}$	24-hour Annual	1.14E-02 2.08E-04	2 1
Savage Run WA	NO_2	Annual	2.22E-04	25
	SO_2	3-hour 24-hour Annual	6.81E-03 8.55E-04 6.25E-06	512 91 20
	PM_{10}	24-hour Annual	3.36E-02 7.00E-04	30 17
	$PM_{2.5}$	24-hour Annual	2.74E-02 3.78E-04	9 4
Wind River RA	NO_2	Annual	3.84E-05	25
	SO_2	3-hour 24-hour Annual	3.33E-04 6.65E-05 1.65E-06	512 91 20
	PM_{10}	24-hour Annual	1.25E-02 2.87E-04	30 17
	$PM_{2.5}$	24-hour Annual	7.18E-03 1.26E-04	9 4

Table 14
Off-Site Processing - Far-Field Criteria Pollutant Impacts Compared to PSD Increments

Location	Pollutant	Averaging Time	Direct Modeled ($\mu g/m^3$)	PSD Increment ($\mu g/m^3$)
Bridger WA	NO_2	Annual	1.59E-04	2.5
	SO_2	3-hour	7.38E-03	25
		24-hour	9.44E-04	5
		Annual	5.75E-06	2
	PM_{10}	24-hour	2.19E-02	8
		Annual	3.87E-04	4
	$PM_{2.5}$	24-hour	7.03E-03	2
		Annual	1.01E-04	1
Fitzpatrick WA	NO_2	Annual	1.14E-05	2.5
	SO_2	3-hour	1.71E-04	25
		24-hour	3.86E-05	5
		Annual	7.54E-07	2
	PM_{10}	24-hour	9.50E-03	8
		Annual	1.32E-04	4
	$PM_{2.5}$	24-hour	4.46E-03	2
		Annual	4.77E-05	1
Mount Zirkel WA	NO_2	Annual	1.19E-04	2.5
	SO_2	3-hour	1.94E-03	25
		24-hour	2.44E-04	5
		Annual	3.86E-06	2
	PM_{10}	24-hour	1.29E-02	8
		Annual	4.72E-04	4
	$PM_{2.5}$	24-hour	7.93E-03	2
		Annual	1.84E-04	1
Washakie WA	NO_2	Annual	7.01E-06	2.5
	SO_2	3-hour	9.60E-05	25
		24-hour	6.87E-05	5
		Annual	8.68E-07	2
	PM_{10}	24-hour	2.08E-02	8
		Annual	1.82E-04	4
	$PM_{2.5}$	24-hour	9.22E-03	2
		Annual	7.10E-05	1
Popo Agie WA	NO_2	Annual	2.04E-04	2.5
	SO_2	3-hour	1.16E-02	25
		24-hour	1.48E-03	5
		Annual	7.37E-06	2
	PM_{10}	24-hour	3.64E-02	8
		Annual	5.06E-04	4
	$PM_{2.5}$	24-hour	6.65E-03	2
		Annual	1.18E-04	1
Savage Run WA	NO_2	Annual	1.83E-04	25
	SO_2	3-hour	6.81E-03	512
		24-hour	8.57E-04	91
		Annual	6.23E-06	20
	PM_{10}	24-hour	3.04E-02	30
		Annual	6.27E-04	17
	$PM_{2.5}$	24-hour	2.59E-02	9
		Annual	2.67E-04	4
Wind River RA	NO_2	Annual	3.01E-05	25
	SO_2	3-hour	3.29E-04	512
		24-hour	6.57E-05	91
		Annual	1.64E-06	20
	PM_{10}	24-hour	1.03E-02	30
		Annual	2.48E-04	17
	$PM_{2.5}$	24-hour	4.91E-03	9
		Annual	7.59E-05	4

5.2.2 Visibility

Change in atmospheric light extinction relative to background conditions is used to measure regional haze. Analysis thresholds for atmospheric light extinction are set forth in FLAG (2010), with the results reported in percent change in light extinction and change in deciview (dv or delta deciview [ddv]). A 5 percent change in light extinction [approximately equal to a 0.5 change in dv (∆dv)] is the threshold recommended in FLAG (2010) and is considered to contribute to regional haze visibility impairment. A 10 percent change in light extinction (approximately equal to 1.0 ∆dv) is considered to represent a noticeable change in visibility when compared to background conditions. The BLM considers a 1.0 ∆dv change as a significant adverse impact; however, there are no applicable local, state, tribal, or federal regulatory visibility standards. It is the responsibility of the jurisdictional FLM or Tribal government responsible for that land to determine when adverse impacts are significant or not, and these may differ from BLM levels for significant adverse impacts.

Visibility impacts were calculated for the each scenario of the Project (Proposed Action) and were evaluated at each Class I and sensitive Class II area of concern to determine if the maximum and 98th percentile change in light extinction exceeds either the 0.5 and 1.0 delta deciview thresholds (equivalent to 5 percent and 10 percent change in light extinction). Results are presented in Table 15 for construction; Table 16 for operations with on-site processing; and Table 17. for operations with off-site processing. The results were reported for each threshold using the 20th percentile best visibility background conditions. The results indicate that, for all modeling scenarios, impacts are below the thresholds of concern at all Class I and sensitive Class II areas.

Table 15
Construction - Far-Field Visibility Impacts Using the 20th Percentile Cleanest Backgrounds

Area of Concern	Days Greater Than 0.5 ∆dv	Days Greater Than 1.0 ∆dv	Maximum ∆dv	98th Percentile ∆dv
Bridger Wilderness Area	0	0	0.032	0.010
Fitzpatrick Wilderness Area	0	0	0.036	0.005
Mount Zirkel Wilderness Area	0	0	0.049	0.020
Washakie Wilderness Area	0	0	0.071	0.013
Popo Agie Wilderness Area	0	0	0.028	0.013
Savage Run Wilderness Area	0	0	0.048	0.005
Wind River Roadless Area	0	0	0.030	0.006

Table 16
On-Site Processing - Far-Field Visibility Impacts Using the 20th Percentile Cleanest Backgrounds

Area of Concern	Days Greater Than 0.5 ∆dv	Days Greater Than 1.0 ∆dv	Maximum ∆dv	98th Percentile ∆dv
Bridger Wilderness Area	0	0	0.037	0.014
Fitzpatrick Wilderness Area	0	0	0.039	0.006
Mount Zirkel Wilderness Area	0	0	0.052	0.022
Washakie Wilderness Area	0	0	0.076	0.015
Popo Agie Wilderness Area	0	0	0.051	0.020
Savage Run Wilderness Area	0	0	0.052	0.006
Wind River Roadless Area	0	0	0.043	0.008

Table 17
Off-Site Processing - Far-Field Visibility Impacts Using the 20th Percentile Cleanest Backgrounds

Area of Concern	Days Greater Than 0.5 ∆dv	Days Greater Than 1.0 ∆dv	Maximum ∆dv	98th Percentile ∆dv
Bridger Wilderness Area	0	0	0.032	0.011
Fitzpatrick Wilderness Area	0	0	0.030	0.004
Mount Zirkel Wilderness Area	0	0	0.046	0.017
Washakie Wilderness Area	0	0	0.060	0.011
Popo Agie Wilderness Area	0	0	0.032	0.011
Savage Run Wilderness Area	0	0	0.046	0.004
Wind River Roadless Area	0	0	0.025	0.005

5.2.3 Deposition

FLAG (2010) recommends that applicable sources assess impacts of N and S deposition at Class I areas. The guidance does recommends the use of deposition analysis thresholds (DATs) developed by the National Park Service and the U.S. Fish and Wildlife Service. The DATs represent screening level values for N and S deposition from project alone emission sources below which estimated impacts are considered insignificant. The DAT established for both N and S in western Class I areas is 0.005 kg/ha-yr. Impacts are presented in Table 18 for construction; Table 19 for operations with on-site processing; and Table 20. for operations with off-site processing. The results indicate that, for all modeling scenarios, impacts are below the DATs at the areas of concern.

Table 18
Construction - Deposition Impacts Compared to the DAT

Area of Concern	Maximum Nitrogen Impact (kg/ha-yr)	Maximum Sulfur Impact (kg/ha-yr)	DAT (kg/ha-yr)	Nitrogen Percent of DAT	Sulfur Percent of DAT
Bridger Wilderness Area	0.0002	0.000005	0.005	4	0.1
Fitzpatrick Wilderness Area	0.0002	0.000004	0.005	3	0.1
Mt Zirkel Wilderness Area	0.0002	0.000002	0.005	4	0.05
Popo Agie Wilderness Area	0.0002	0.000006	0.005	5	0.1
Savage Run Wilderness Area	0.0004	0.000004	0.005	7	0.1
Washakie Wilderness Area	0.0001	0.000002	0.005	2	0.04
Wind River Roadless Area	0.0002	0.000004	0.005	3	0.1

Table 19
On-Site Processing - Deposition Impacts Compared to the DAT

Area of Concern	Maximum Nitrogen Impact (kg/ha-yr)	Maximum Sulfur Impact (kg/ha-yr)	DAT (kg/ha-yr)	Nitrogen Percent of DAT	Sulfur Percent of DAT
Bridger Wilderness Area	0.0002	0.000005	0.005	4	0.10
Fitzpatrick Wilderness Area	0.0002	0.000004	0.005	3	0.10
Mt Zirkel Wilderness Area	0.0002	0.000002	0.005	4	0.05
Popo Agie Wilderness Area	0.0002	0.000006	0.005	5	0.10
Savage Run Wilderness Area	0.0004	0.000004	0.005	7	0.10
Washakie Wilderness Area	0.0001	0.000002	0.005	2	0.04
Wind River Roadless Area	0.0002	0.000004	0.005	3	0.10

Table 20
Off-Site Processing - Deposition Impacts Compared to the DAT

Area of Concern	Maximum Nitrogen Impact (kg/ha-yr)	Maximum Sulfur Impact (kg/ha-yr)	DAT (kg/ha-yr)	Nitrogen Percent of DAT	Sulfur Percent of DAT
Bridger Wilderness Area	0.0002	0.000005	0.005	3	0.10
Fitzpatrick Wilderness Area	0.0001	0.000004	0.005	3	0.10
Mt Zirkel Wilderness Area	0.0002	0.000002	0.005	3	0.05
Popo Agie Wilderness Area	0.0002	0.000006	0.005	4	0.10
Savage Run Wilderness Area	0.0003	0.000004	0.005	6	0.10
Washakie Wilderness Area	0.0001	0.000002	0.005	1	0.04
Wind River Roadless Area	0.0001	0.000004	0.005	3	0.10

5.2.4 ANC

The CALPUFF-predicted annual deposition fluxes of S and N at sensitive lake receptors listed in Section 4.5 were used to estimate the change in ANC. The predicted changes in ANC were compared with the Forest Service's Level of Acceptable Change (LAC) thresholds of a 10 percent change in ANC for lakes with ANC values equal to or greater than 25 µeq/l and 1 µeq/l for lakes with ANC values of 25 µeq/l and less. Results are presented in Table 21 for construction; Table 22 for operations with on-site processing; and Table 23. for operations with off-site processing. The results indicate that, for all modeling scenarios, impacts are below the thresholds of concern at each of the sensitive lakes.

Table 21
Construction ANC Impacts

Sensitive Lake	Annual Precipitation[1] (meters)	ANC Value[2] (µeq/l)	N (kg/ha-yr)	S (kg/ha-yr)	ANC Relative Change[3] (percent)	ANC Absolute Change[3] (µeq/l)
Black Joe Lake	1.6	62.6	1.52E-04	3.05E-06	0.002	n/a
Deep Lake	1.4	57.7	1.55E-04	3.34E-06	0.002	n/a
Hobbs Lake	1.1	69.9	8.45E-05	1.42E-06	0.001	n/a
Lazy Boy	1.1	9.1	1.06E-04	2.30E-06	n/a	0.001
Lower Saddlebag Lake	1.1	54.6	2.06E-04	5.13E-06	0.004	n/a
Ross Lake	1.1	53.0	1.23E-04	2.74E-06	0.002	n/a
Upper Frozen Lake	0.8	7.5	1.57E-04	3.58E-06	n/a	0.002
Lake Elbert	1.7	56.9	1.90E-04	1.57E-06	0.002	n/a
Seven Lakes	1.3	36.2	2.10E-04	1.93E-06	0.005	n/a
Summit Lake	1.4	48	1.96E-04	1.49E-06	0.003	n/a

[1] 2008 annual precipitation for these sites from PRISM.
[2] 10th Percentile Lowest ANC Values reported.
[3] For lakes with baseline ANC values less than 25 µeq/l, the threshold is 1 µeq/l. For lakes with baseline ANC values equal to or greater than 25 µeq/l the threshold is a 10 percent change in ANC.

Table 22
On-Site Processing ANC Impacts

Sensitive Lake	Annual Precipitation[1] (meters)	ANC Value[2] (µeq/l)	N (kg/ha-yr)	S (kg/ha-yr)	ANC Relative Change[3] (percent)	ANC Absolute Change[3] (µeq/l)
Black Joe Lake	1.6	62.6	1.52E-04	3.06E-06	0.002	n/a
Deep Lake	1.4	57.7	1.56E-04	3.35E-06	0.002	n/a
Hobbs Lake	1.1	69.9	8.47E-05	1.43E-06	0.001	n/a
Lazy Boy	1.1	9.1	1.06E-04	2.31E-06	n/a	0.001
Lower Saddlebag Lake	1.1	54.6	2.06E-04	5.14E-06	0.004	n/a
Ross Lake	1.1	53.0	1.23E-04	2.76E-06	0.002	n/a
Upper Frozen Lake	0.8	7.5	1.57E-04	3.60E-06	n/a	0.002
Lake Elbert	1.7	56.9	1.90E-04	1.58E-06	0.002	n/a
Seven Lakes	1.3	36.2	2.11E-04	1.94E-06	0.005	n/a
Summit Lake	1.4	48	1.96E-04	1.49E-06	0.003	n/a

[1] 2008 annual precipitation for these sites from PRISM.
[2] 10th Percentile Lowest ANC Values reported.
[3] For lakes with baseline ANC values less than 25 µeq/l, the threshold is 1 µeq/l. For lakes with baseline ANC values equal to or greater than 25 µeq/l the threshold is a 10 percent change in ANC.

Table 23
Off-Site Processing ANC Impacts

Sensitive Lake	Annual Precipitation[1] (meters)	ANC Value[2] (µeq/l)	N (kg/ha-yr)	S (kg/ha-yr)	ANC Relative Change[3] (percent)	ANC Absolute Change[3] (µeq/l)
Black Joe Lake	1.6	62.6	1.21E-04	3.04E-06	0.001	n/a
Deep Lake	1.4	57.7	1.25E-04	3.33E-06	0.002	n/a
Hobbs Lake	1.1	69.9	6.62E-05	1.42E-06	0.001	n/a
Lazy Boy	1.1	9.1	8.30E-05	2.29E-06	n/a	0.001
Lower Saddlebag Lake	1.1	54.6	1.70E-04	5.12E-06	0.003	n/a
Ross Lake	1.1	53.0	9.57E-05	2.73E-06	0.002	n/a
Upper Frozen Lake	0.8	7.5	1.28E-04	3.58E-06	n/a	0.002
Lake Elbert	1.7	56.9	1.48E-04	1.57E-06	0.002	n/a
Seven Lakes	1.3	36.2	1.64E-04	1.92E-06	0.004	n/a
Summit Lake	1.4	48	1.52E-04	1.48E-06	0.002	n/a

[1] 2008 annual precipitation for these sites from PRISM.
[2] 10th Percentile Lowest ANC Values reported.
[3] For lakes with baseline ANC values less than 25 µeq/l, the threshold is 1 µeq/l. For lakes with baseline ANC values equal to or greater than 25 µeq/l the threshold is a 10 percent change in ANC.

6.0 REFERENCES

Argonne National Laboratory (ANL). 1989. MILDOS-AREA: An Enhanced Version of MILDOS for Large-Area Sources, June. ANL/ES-161.

Bureau of Indian Affairs. 2008. Riverton Dome Coal Bed Natural Gas and Conventional Gas Development Project. Bureau of Indian Affairs, Wind River Agency, Fort Washakie, Wyoming. August 2008.

Bureau of Land Management. 2014a. Air Quality Impact Assessment Protocol for the Energy Fuels Wyoming Inc. Sheep Mountain Project Environmental Impact Statement. Carter Lake Consulting and Edge Environmental. March.

BLM. 2014b. Final Environmental Impact Statement, Continental Divide-Creston Natural Gas Development Project, Draft Air Quality Technical Support Document -Department of Interior, Bureau of Land Management Wyoming High Desert District - Rawlins Field Office, Wyoming, July 2014.

California Air Pollution Control Officers Association (CAPCOA). 2011. Modeling Compliance of the Federal 1-Hour NO_2 NAAQS. CAPCOA Guidance Document, prepared by CAPCOA Engineering Managers NO_2 Modeling Committee, October 27, 2011. Accessed onlin: http://www.valleyair.org/busind/pto/Tox_Resources/CAPCOANO2GuidanceDocument10-27-11.pdf.

Energy Fuels Resources (USA) Inc. 2014. Revision to Permit to Mine 381c Sheep Mountain Project, Fremont County, Wyoming. Submitted to Wyoming Department of Environmental Quality Land Quality Division, District 2, Lander, Wyoming. Submitted by Energy Fuels Resources (USA) Inc., Lakewood, Colorado. January 2014.

ENVIRON, Alpine Geophysics and University of North Carolina. 2012. Western Regional Air Partnership (WRAP) West-wide Jump Start Air Quality Modeling Study (WestJumpAQMS) WRF Application/Evaluation. Prepared for Tom Moore WRAP. January 20, 2012.

ENVIRON. 2013. The Mesoscale Model Interface Program (MMIF) Version 3.0, Draft Users Manual. Prepared for Environmental Protection Agency Office of Air Quality Planning and Standards, Air Quality Assessment Division, Air Quality Modeling Group, Research Triangle Park, North Carolina. September 30, 2013.

Environmental Protection Agency. 1995. AP-42 Fifth Edition. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources. EPA Office of Air Quality Planning and Standards, Research Triangle Park, NC. With updates through 2009.

______. 2000. Meteorological Monitoring Guidance for Regulatory Modeling Applications. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. February 2000.

______. 2005. Guideline on Air Quality Models. Updated 2005. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. Published in Federal Register, Vol. 70, No. 216, November 9, 2005.

______. 2009. Clarification on EPA-FLM Recommended Settings for CALMET. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. August 31, 2009.

______. 2013. NO2/NOx In-Stack Ratio (ISR) Database (8/26/2013). Office of Air Quality Planning and Standards (OAQPS). Technology Transfer Network, Support Center for Regulatory Atmospheric Modeling Website. Accessed online: http://www.epa.gov/ttn/scram.

Federal Land Managers' Air Quality Related Values Workgroup. 2010. Federal Land Managers' Air Quality Related Values Workgroup (FLAG) Phase I Report – Revised (2010). U.S. Forest Service-Air Quality Program, National Park Service-Air Resources Division, U.S. Fish and Wildlife Service-Air Quality Branch. October 2010.

PRISM. 2014. Parameter-elevation Regressionson Independent Slopes Model (PRISM), PRISM Climate Group, Oregon State University. Accessed online: http://prism.oregonstate.edu/.

U.S. Forest Service. 2000. Screening Methodology for Calculating ANC Change to High Elevation Lakes, User's Guide. U.S. Department of Agriculture (USDA) Forest Service, Rocky Mountain Region. January 2000.

______. 2014. Lake water chemistry provided by the USDA Forest Service, January 2014. http://views.cira.colostate.edu/edmf/explorer/default.aspx?btid=FEDBanner1&ssp=~/css/fed1.css.

Wyoming Department of Environmental Quality. 2010. Guidance for Conducting Near-Field Modeling Analyses for Minor Sources. Wyoming Department of Environmental Quality Air Quality Division, January 2010.

____. 2014. Background pollutant concentration data provided by Ann Shed, Wyoming Department of Environmental Quality Air Quality Division to Susan Connell, Carter Lake Consulting LLC, via email, January 27, 2014.

APPENDIX A

AIR POLLUTANT EMISSIONS INVENTORY
SHEEP MOUNTAIN MINE

Sheep Mountain Mine
Construction Phase
Air Emissions Summary

Appendix A - Table C1

Source ID Number	Description	General Location	Point, Fugitive or Nonroad	Annual PM_{10} Emissions (tpy) [1]	24-Hour PM_{10} Emissions (lb/day)	Annual $PM_{2.5}$ Emissions (tpy) [1]	24-Hour $PM_{2.5}$ Emissions (lb/day)	Annual NO_x Emissions (tpy) [1]	24-Hour NO_x Emissions (lb/day)	Annual CO Emissions (tpy) [1]	24-Hour CO Emissions (lb/day)	Annual SO_2 Emissions (tpy) [1]	24-Hour SO_2 Emissions (lb/day)	Annual VOC Emissions (tpy) [1]	24-Hour VOC Emissions (lb/day)	Annual H2SO4 Emissions (tpy)	Annual H2SO4 Emissions (lb/day)	Annual CH_2O Emissions (tpy)	24-Hour CH_2O Emissions (lb/day)	Annual CO2e Emissions (metric tpy)	Annual Benzene Emissions (tpy)	Annual Toluene Emissions (tpy)	Annual Ethylbenzene Emissions (tpy)	Annual n-hexane Emissions (tpy)
1.0	**Mine Sources**																							
	Blasting - Particulate	Underground	F	0.0139	0.0802	0.0008	0.0046	--	--	--	--	--	--	--	--	--	--	--	--	--				
	Blasting - Gaseous	Underground	F	--	--	--	--	6.3450	34.8100	22.1225	121.4600	0.6025	3.3100	--	--	--	--	--	--	--				
	Natural Gas Heaters - Mine Intake	Underground	P	0.0034	0.0187	0.0034	0.0187	0.0450	0.2466	0.0378	0.2071	0.0003	0.0015	0.0025	0.0136	--	--	3.38E-05	1.85E-04	49.1022	9.45E-07	1.53E-06	--	8.10E-04
	Underground Mine Construction	Underground	F	0.0772	0.4232	0.0154	0.0846	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Underground Mobile Sources	Underground	N	2.5472	19.5936	2.5472	19.5936	42.1337	324.1051	44.8769	345.2073	--	--	5.1356	39.5043	--	--	0.8408	6.4680	4852.9663	0.0537	0.0780	0.0092	0.0000
																					--	--	--	--
2.0	**Surface Sources**																				--	--	--	--
	Dozing	Pit	F	7.4264	57.1264	3.8996	29.9973	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overburden Removal	Pit	F	1.6560	9.0720	0.3312	1.8144	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overburden Unloading	Spoils	F	0.3566	1.9537	0.0713	0.3907	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Facility Construction	Facility	F	0.5280	5.8667	0.0792	0.8800	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Facilities Material Removal	Facility	F	2.6550	14.5485	0.5310	2.9097	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Facilities Material Unloading	Facility	F	0.5718	3.1332	0.1144	0.6266	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3.0	**Unpaved Roads**																							
	Water Trucks	Haul Routes	F	5.3053	63.1579	0.5305	6.3158	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Support Vehicles	Unpaved Access Road	F	0.9034	197.6076	0.0903	19.7608	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Bulk Delivery Trucks	Unpaved Access Road	F	0.3733	3.2661	0.0373	0.3266	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Misc. Delivery Trucks	Unpaved Access Road	F	0.2277	1.9922	0.0228	0.1992	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Material Delivery Trucks	Unpaved Access Road	F	0.1923	3.0088	0.0192	0.3009	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Light Vehicles	Unpaved Access Road	F	5.7736	173.6126	0.5774	17.3613	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4.0	**Wind Erosion**																							
	Open Acres	Mine-Wide	F	9.9180	54.3452	1.4877	8.1518	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Stockpiles	Mine-Wide	F	2.7945	15.3121	0.4192	2.2968	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5.0	**Surface Mobile Sources**																							
	Surface Mobile/Nonroad Sources	Mine-Wide	N/M	1.9890	10.9288	1.9890	10.9288	199.0330	1093.5880	119.6273	657.2928	0.2732	1.5012	14.0182	77.0229	--	--	5.2987	29.1136	6186.4053	0.4270	0.2066	0.0496	0.0996
	Total Point Source Emissions			0.0034	0.0187	0.0034	0.0187	0.0450	0.2466	0.0378	0.2071	0.0003	0.0015	0.0025	0.0136	--	--	3.38E-05	1.85E-04	49.1022	9.45E-07	1.53E-06	--	8.10E-04
	Total Fugitive Source Emissions			38.7729	604.5065	8.2274	91.4212	6.3450	34.8100	22.1225	121.4600	0.6025	3.3100	--	--	--	--	--	--	--	--	--	--	--
	Total Nonroad/Mobile Source Emissions			4.5362	30.5224	4.5362	30.5224	241.1667	1417.6931	164.5042	1002.5000	0.2732	1.5012	19.1537	116.5272	--	--	6.1395	35.5816	11039.3717	0.4807	0.2845	0.0588	0.0996
	Total Construction Phase			43.31		12.77		247.56		186.66		0.88		19.16		0.00		6.14		11088.47	0.4807	0.2845	0.0588	0.1005

1. Annual emission rates may not be equivalent to daily emission rates x 365 days/year due to limitations on annual operating schedule, fuel input, or other factors. See individual calculation sheets for source-specific details.

Sheep Mountain Mine
Production Phase with Off-Site Processing
Air Emissions Summary

Appendix A - Table PF1

Source ID Number	Description	General Location	Point, Fugitive or Nonroad	Annual PM_{10} Emissions (tpy) [1]	24-Hour PM_{10} Emissions (lb/day)	Annual $PM_{2.5}$ Emissions (tpy) [1]	24-Hour $PM_{2.5}$ Emissions (lb/day)	Annual NO_x Emissions (tpy) [1]	24-Hour NO_x Emissions (lb/day)	Annual CO Emissions (tpy) [1]	24-Hour CO Emissions (lb/day)	Annual SO_2 Emissions (tpy) [1]	24-Hour SO_2 Emissions (lb/day)	Annual VOC Emissions (tpy) [1]	24-Hour VOC Emissions (lb/day)	Annual H2SO4 Emissions (tpy)	Annual H2SO4 Emissions (lb/day)	Annual CH_2O Emissions (tpy)	24-Hour CH_2O Emissions (lb/day)	Annual CO2e Emissions (metric tpy)	Annual Benzene Emissions (tpy)	Annual Toluene Emissions (tpy)	Annual Ethylbenzene Emissions (tpy)	Annual n-hexane Emissions (tpy)
1.0	**Mine Sources**																							
	Blasting - Particulate	Underground	F	0.0139	0.0802	0.0008	0.0046	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Blasting - Gaseous	Underground	F	--	--	--	--	6.3450	34.8100	22.1225	121.4600	0.6025	3.3100	--	--	--	--	--	--	--	--	--	--	--
	Natural Gas Heaters - Mine Intake	Underground	P	0.0034	0.0187	0.0034	0.0187	0.0450	0.2466	0.0378	0.2071	0.0003	0.0015	0.0025	0.0136	--	--	3.38E-05	1.85E-04	49.1022	9.45E-07	1.53E-06	--	8.10E-04
	Primary Crusher	Underground	P	0.1656	1.3500	0.0248	0.2025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Coarse Ore Conveyor Transfers	Underground	P	0.0772	0.4230	0.0154	0.0846	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Underground Mobile Sources	Underground	N	2.5472	19.5936	2.5472	19.5936	42.1337	324.1051	44.8769	345.2073	0.0915	0.7041	5.1356	39.5043	--	--	0.8408	6.4680	3525.7090	0.0537	0.0780	0.0092	0.0000
2.0	**Surface Sources**																							
	Dozing	Pit	F	7.4264	28.5632	3.8996	14.9986	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Product Removal	Pit	F	0.3312	1.8144	0.0662	0.3629	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overburden Removal	Pit	F	35.1897	192.8250	7.0379	38.5650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overburden Unloading	Spoils	F	7.5784	41.5267	1.5157	8.3053	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Truck Dump	Truck Dump	P	1.8768	10.2838	0.3754	2.0568	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Primary Crusher	Crusher	P	0.3312	2.7000	0.0497	0.4050	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overland Coarse Ore Conveyor	Crusher to Pad	P	2.4128	13.2208	0.4826	2.6442	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Radial Stacker to Leach Pad	Leach Pad	F	0.7307	4.0039	0.1461	0.8008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Surface Facilities Heating	Shop, Plant, Office	P	0.0150	0.0822	0.0150	0.0822	0.1975	1.0822	0.1659	0.9090	0.0012	0.0065	0.0109	0.0595	--	--	0.0001	0.0008	215.5042	4.15E-06	6.72E-06	--	0.0036
	Production Facility-Point Sources	Plant	P	0.0520	5.5306	0.0519	5.5302	0.6925	77.7132	0.4844	18.5827	0.0135	4.9622	41.7635	234.7306	0.0000	0.0000	--	--	--	--	--	--	--
	Production Facility-Fugitive Sources	Plant	F	21.8880	119.9342	3.2832	17.9901	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3.0	**Unpaved Roads**																							
	Surface Ore Haul to Truck Dump	Pit to Truck Dump	F	5.7173	29.3626	0.5717	2.9363	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Haul to Off-Site Mill	Ore Stckpl to Mill	F	24.0125	154.1537	2.4013	15.4154	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Surface Haul OB to Hanks Draw Spoils	Pit to Spoils	F	49.1143	317.8920	4.9114	31.7892																	
	Surface Haul OB to South Spoils	Pit to Spoils	F	27.0201	174.8871	2.7020	17.4887																	
	Water Trucks (2)	Haul Routes	F	5.3053	63.1579	0.5305	6.3158	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Haul Road Repair (Grading)	Haul Routes	F	0.4781	3.8250	0.0433	0.6585	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Light Vehicles	Unpaved Roads	F	2.0577	28.9354	0.2058	2.8935	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Bulk Delivery Trucks[6]	Haul Routes	F	0.3594	6.5322	0.0359	0.6532	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4.0	**Wind Erosion**																							
	Open Acres	Mine-Wide	F	24.6240	134.9260	3.6936	20.2389	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Stockpiles	Mine-Wide	F	34.8271	190.8332	5.2241	28.6250	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5.0	**Surface Mobile Sources**																							
	Surface Mobile/Nonroad Sources	Mine-Wide	N/M	1.2906	7.0914	1.2906	7.0914	151.6612	833.3031	89.0888	489.4989	0.1951	1.0718	10.4838	57.6035	--	--	4.0354	22.1727	7513.6627	0.1044	0.0554	0.0124	0.0232
	Total Point Source Emissions			4.9340	33.6092	1.0182	11.0243	0.9350	79.0419	0.6881	19.6989	0.0150	4.9702	41.7768	234.8036	0.0000	0.0000	1.82E-04	1.85E-04	264.6064	5.09E-06	8.25E-06	--	4.37E-03
	Total Fugitive Source Emissions			246.6742	1493.2529	36.2693	208.0419	6.3450	34.8100	22.1225	121.4600	0.6025	3.3100	--	--	--	--	--	--	--	--	--	--	--
	Total Nonroad/Mobile Source Emissions			3.8378	26.6850	3.8378	26.6850	193.7948	1157.4083	133.9657	834.7061	0.2866	1.7759	15.6194	97.1078	0.0000	0.0000	4.8763	28.6407	11039.3717	0.1580	0.1333	0.0216	0.0232
	Total Annual Emissions Production Phase			255.4459		41.1253		201.0749		156.7764		0.9041		57.3962		0.0000		4.8764		11303.9780	0.1580	0.1333	0.0216	0.0275

1. Annual emission rates may not be equivalent to daily emission rates x 365 days/year due to limitations on annual operating schedule, fuel input, or other factors. See individual calculation sheets for source-specific details.

Sheep Mountain Mine
Production Phase with On-Site Processing
Air Emissions Summary

Appendix A - Table PN1

Source ID Number	Description	General Location	Point, Fugitive or Nonroad	Annual PM_{10} Emissions (tpy) [1]	24-Hour PM_{10} Emissions (lb/day)	Annual $PM_{2.5}$ Emissions (tpy) [1]	24-Hour $PM_{2.5}$ Emissions (lb/day)	Annual NO_x Emissions (tpy) [1]	24-Hour NO_x Emissions (lb/day)	Annual CO Emissions (tpy) [1]	24-Hour CO Emissions (lb/day)	Annual SO_2 Emissions (tpy) [1]	24-Hour SO_2 Emissions (lb/day)	Annual VOC Emissions (tpy) [1]	24-Hour VOC Emissions (lb/day)	Annual H2SO4 Emissions (tpy)	Annual H2SO4 Emissions (lb/day)	Annual CH_2O Emissions (tpy)	24-Hour CH_2O Emissions (lb/day)	Annual CO2e Emissions (metric tpy)	Annual Benzene Emissions (tpy)	Annual Toluene Emissions (tpy)	Annual Ethylbenzene Emissions (tpy)	Annual n-hexane Emissions (tpy)
1.0	**Mine Sources**																							
	Blasting - Particulate	Underground	F	0.0139	0.0802	0.0008	0.0046	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Blasting - Gaseous	Underground	F	--	--	--	--	6.3450	34.8100	22.1225	121.4600	0.6025	3.3100	--	--	--	--	--	--	--	--	--	--	--
	Natural Gas Heaters - Mine Intake	Underground	P	0.0034	0.0187	0.0034	0.0187	0.0450	0.2466	0.0378	0.2071	0.0003	0.0015	0.0025	0.0136	--	--	3.38E-05	1.85E-04	49.10	9.45E-07	1.53E-06	--	8.10E-04
	Primary Crusher	Underground	P	0.1656	1.3500	0.0248	0.2025	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Coarse Ore Conveyor Transfers	Underground	P	0.0772	0.4230	0.0154	0.0846	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Underground Mobile Sources	Underground	N	2.5472	19.5936	2.5472	19.5936	42.1337	324.1051	44.8769	345.2073	--	--	5.1356	39.5043	--	--	0.8408	6.4680	3676.8986	0.0537	0.0780	0.0092	0.0000
2.0	**Surface Sources**																							
	Dozing	Pit	F	7.4264	57.1264	3.8996	29.9973	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Product Removal	Pit	F	0.3312	1.8144	0.0662	0.3629	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overburden Removal	Pit	F	35.1897	192.8250	7.0379	38.5650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overburden Unloading	Spoils	F	7.5784	41.5267	1.5157	8.3053	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Truck Dump	Truck Dump	P	1.8768	10.2838	0.3754	2.0568	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Primary Crusher	Crusher	P	0.3312	2.7000	0.0497	0.4050	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Overland Coarse Ore Conveyor	Crusher to Pad	P	2.4128	13.2208	0.4826	2.6442	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Radial Stacker to Leach Pad	Leach Pad	F	0.7307	4.0039	0.1461	0.8008	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Surface Facilities Heating	Shop, Plant, Office	P	0.0150	0.0822	0.0150	0.0822	0.1975	1.0822	0.1659	0.9090	0.0012	0.0065	0.0109	0.0595	--	--	0.0001	0.0008	215.5042	4.15E-06	6.72E-06	--	0.0036
	Production Facility-Point Sources	Plant	P	0.0520	5.5306	0.0519	5.5302	0.6925	77.7132	0.4844	18.5827	0.0135	4.9622	41.7635	234.7306	0.0000	0.0000	--	--	--	--	--	--	--
	Production Facility-Fugitive Sources	Plant	F	21.8880	119.9342	3.2832	17.9901	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
3.0	**Unpaved Roads**																							
	Surface Ore Haul to Truck Dump	Pit to Truck Dump	F	4.0838	29.3626	0.4084	2.9363	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Surface OB Haul to Hanks Draw Spoils	Pit to Hanks Draw Spoils	F	49.1143	317.8920	4.9114	31.7892	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Surface OB Haul to South Spoils	Pit to South Spoils	F	27.0201	174.8871	2.7020	17.4887	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Water Trucks	Haul Routes	F	5.3053	63.1579	0.5305	6.3158	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Haul Road Repair	Haul Routes	F	0.4781	3.8250	0.0433	0.6585	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Light Vehicles	Unpaved Roads	F	2.0577	28.9354	0.2058	2.8935	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Bulk Delivery Trucks	Haul Routes	F	0.3594	6.5322	0.0359	0.6532	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4.0	**Wind Erosion**																							
	Open Acres	Mine-Wide	F	24.6240	134.9260	3.6936	20.2389	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	Stockpiles	Mine-Wide	F	33.9248	185.8894	5.0887	27.8834	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5.0	**Surface Mobile Sources**																							
	Surface Mobile/Nonroad Sources	Mine-Wide	N/M	1.2406	6.8164	1.2406	6.8164	136.6471	750.8085	80.4140	441.8353	0.1833	1.0071	9.4829	52.1038	--	--	3.6350	19.9728	7362.4731	0.2818	0.1399	0.0330	0.0649
	Total Point Source Emissions			4.9340	33.6092	1.0182	11.0243	0.9350	79.0419	0.6881	19.6989	0.0150	4.9702	41.7768	234.8036	0.0000	0.0000	0.0002	0.0010	264.6064	5.09E-06	8.25E-06	--	0.0044
	Total Fugitive Source Emissions			220.1259	1362.7185	33.5694	206.8836	6.3450	34.8100	22.1225	121.4600	0.6025	3.3100	--	--	--	--	--	--	--	--	--	--	--
	Total Nonroad/Mobile Source Emissions			3.7878	26.4100	3.7878	26.4100	178.7808	1074.9136	125.2910	787.0426	0.1833	1.0071	14.6185	91.6081	0.0000	0.0000	4.4759	26.4408	11039.3717	0.3354	0.2178	0.0422	0.0649
	Total Annual Emissions Production Phase			228.8476		38.3753		186.0609		148.1016		0.8008		56.3953		0.0000		4.4761		11303.9780	0.3354	0.2178	0.0422	0.0692

1. Annual emission rates may not be equivalent to daily emission rates x 365 days/year due to limitations on annual operating schedule, fuel input, or other factors. See individual calculation sheets for source-specific details.

APPENDIX B

RADIOLOGICAL IMPACTS ANALYSIS TECHNICAL DOCUMENT

Estimated Radiation Doses
To Members of the Public
from the Proposed Sheep Mountain Mine

Prepared for:

U.S. Department of the Interior
Bureau of Land Management
Lander Field Office
Lander, Wyoming

Prepared by:

Two Lines, Inc.
896 Overview Rd.
Grand Junction, Colorado

August, 2014

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LIST OF FIGURES

LIST OF MAPS

LIST OF ABBREVIATIONS AND ACRONYMS

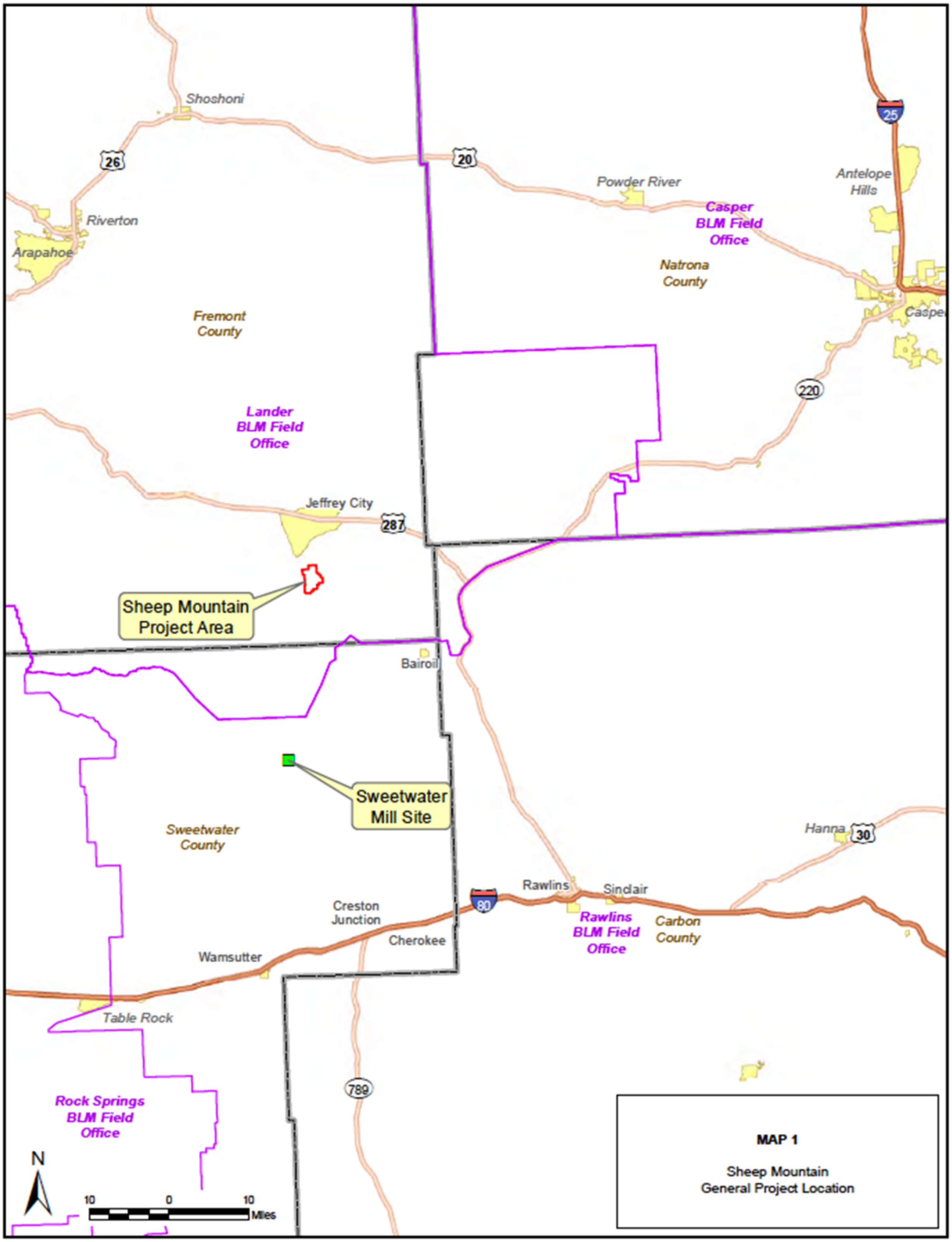
222Rn	radon-222
226Ra	radium-226
238U	uranium-238
ANL	Argonne National Laboratory
AQTSD	Air Quality Technical Support Document
CPP	Central Processing Plant
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
Energy Fuels	Energy Fuels Resources (USA) Inc.
EPA	U.S. Environmental Protection Agency
ISR	in situ recovery
Kennecott	Kennecott Uranium Company
MILDOS	MILDOS-AREA version 3.10
NRC	Nuclear Regulatory Commission
TEDE	total effective dose equivalents
TLI	Two Lines, Inc.

1.0 INTRODUCTION

Energy Fuels Resources (USA) Inc. (Energy Fuels) is proposing to develop and operate the Sheep Mountain mine located approximately 8 road miles South of Jeffrey City, Wyoming in Fremont County, Township 28 North, Range 92 West, Sections 4, 5, 9, 16, 17, 20, 21, 27, 29, 30, 32 and 33, as shown on Map 1. This area lies approximately 62 road miles southeast of Riverton, approximately 67 miles north of Rawlins, and approximately 105 road miles west of Casper and is located on Jeffrey City and Crooks Peak U.S. Geological Survey 7.5-minute topographic quadrangles. The Project Area includes approximately 3,625 surface acres (approximately 5.7 square miles) of mixed ownership including 2,313 acres of federal surface, 768 acres under state ownership, and 544 acres of fee lands. Approximately 2,836 acres of federal mineral estate is included in the Project Area.

The Project will include an open pit mine (the Congo Pit) and an underground mine with two adits. A heap leach uranium processing facility will be built to the south of the mines. Potential doses to members of the public from the heap leach facility were modeled previously and will be included in Energy Fuels' license application to the Nuclear Regulatory Commission (NRC).

In support of the Environmental Impact Statement (EIS) for the Sheep Mountain Project, Two Lines, Inc. (TLI) was asked to model potential radiation doses to members of the public that would result from releases from the Project. This report describes the modeling approach and results.


Shoshoni
26
20
Riverton
Arapahoe
Powder River
Casper BLM Field Office
Antelope Hills
25
Natrona County
Casper
Fremont County
220
Lander BLM Field Office
Jeffrey City
287
Sheep Mountain Project Area
Bairoil
Sweetwater Mill Site
Sweetwater County
Hanna
30
Rawlins
Sinclair
Creston Junction
80
Rawlins BLM Field Office
Carbon County
Cherokee
Wamsutter
Table Rock
789
Rock Springs BLM Field Office
N
10
0
10
Miles
MAP 1
Sheep Mountain General Project Location

2.0 PROJECT DESCRIPTION

Energy Fuels proposes to explore for, and develop uranium reserves to extract approximately 1.0 million to 2.0 million pounds of uranium from the ore per year during active operations (estimated at 20 years). Mining would be completed using conventional methods including both open-pit and underground methods. There are three principal phases in the Proposed Action: Construction, Operations, and Reclamation. The Proposed Action would require up to 929 acres of disturbance of which 356.5 acres would be new disturbance and 572.5 acres was previously disturbed.

Construction includes the building of facilities and installation of equipment that would be needed prior to Operations. Operations would include the mining and milling of uranium ore (Map 2). Conventional open pit (Congo Pit) and modified room and pillar underground (Sheep Underground) mining methods would be employed to remove mineralized uranium ore. Ore from both the Congo Pit and underground mine would be stockpiled at the entry to the underground mine on the Ore Stockpile for later transport to:

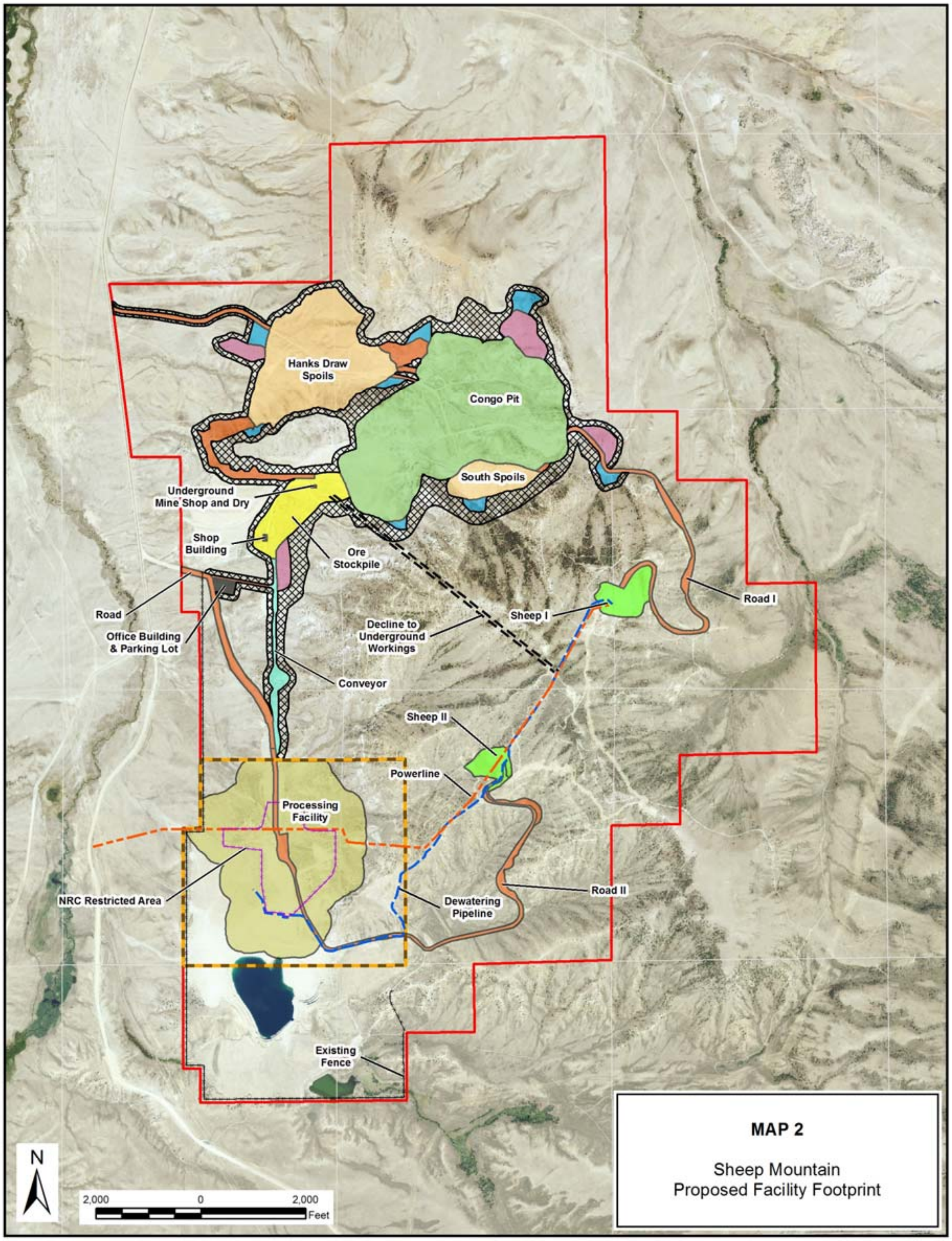
- An On-Site Ore Processing Facility, which would be licensed by the NRC as a uranium processing mill. Ore would be transported to this Facility via conveyor, which would be within the Project Area. The Facility would include a Heap Leach Pad for dissolution of the uranium from the ore; a series of Treatment Ponds (Holding Pond, Collection Pond, and Raffinate Pond) for the solution from the Pad; an Extraction Plant for removing the ore from solution, and a Precipitation and Packaging Plant.
- An Off-Site Ore Processing Facility. Ore would be transported to this location via truck to the Sweetwater Mill. The Sweetwater Uranium Mill is owned and operated by Kennecott Uranium Company (Kennecott), a division of Rio Tinto Americas, Inc. The mill is located entirely on private lands owned by Kennecott.

The option to pursue off-site processing is a sub-part of the Proposed Action because it is advanced by Energy Fuels. The Sweetwater Uranium Mill (owned and operated by Kennecott Uranium Company - Kennecott, a division of Rio Tinto) is located entirely on private lands owned by Kennecott and permitted with the NRC as an operating license under Source Material License SUA-1350 which allows for production of 4,100,000 pounds of yellowcake per year. Therefore, Kennecott could receive ore and begin operations under the stipulations of their permit at any time. For the purpose of analysis within this EIS, it is assumed that operations at the Sweetwater Mill would occur under the existing license without significant revisions, and impacts associated with the operations of the mill would be similar to those of the operation of the Heap Leach facility at Sheep Mountain and/or the Piñon Ridge Mill in Colorado in relation to applicable resources such as air and human health and safety. The impacts associated with hauling ore to the Sweetwater Mill from the Sheep Mountain site and operating the Sweetwater Mill are disclosed in this EIS because they are connected actions. However, the BLM would not be involved in permitting or authorizing hauling of ore to the Sweetwater Mill along county roads or processing at the Sweetwater Mill.

Reclamation would include decommissioning of facilities, backfilling, and re-vegetating of the mined areas, and covering of the heap leach pad to prepare for long-term care and maintenance by the State of Wyoming or the U.S. Department of Energy (DOE).

As mentioned above, potential doses to members of the public from the NRC-regulated heap leach facility would be part of Energy Fuels' license application to the NRC. The purpose of this report is to describe potential doses to members of the public from mining-related activities including the Congo Pit, stockpiling of ore, storage of spoils materials and releases from the underground mine adits.

Potential doses were modeled using MILDOS-AREA version 3.10 (MILDOS), released in 2012. The users manual for MILDOS was published in 1989 by Argonne National Laboratory (ANL, 1989) and has not been updated since that time. A new version of MILDOS-AREA is undergoing beta testing at this time, but has not been released for use.


Hanks Draw Spoils
Congo Pit
South Spoils
Underground Mine Shop and Dry
Shop Building
Ore Stockpile
Road
Office Building & Parking Lot
Decline to Underground Workings
Sheep I
Road I
Conveyor
Sheep II
Powerline
Processing Facility
NRC Restricted Area
Dewatering Pipeline
Road II
Existing Fence
N
2,000
0
2,000
Feet
MAP 2
Sheep Mountain
Proposed Facility Footprint

3.0 POTENTIAL RADIOACTIVE EFFLUENTS

Uranium-238 (^{238}U) in the ore body ultimately decays to radium-226 (^{226}Ra) and then radon-222 (^{222}Rn). MILDOS was designed to model releases of uranium decay products from uranium production facilities including conventional mills. It was later amended to include modules for *in* situ recovery facilities and may be used to model releases from heap leach facilities, as well. For the purposes of this Project, doses to members of the public were modeled to arise from radioactive material released from the following site features:

- **Congo Pit**: Radon from the pit will be released when the encountered ore is disturbed. Radioparticulates from the pit were not modeled on the assumption that water spray would limit releases from the rim of the pit, especially as it gets deeper.
- **Ore stockpile**: Radon as well as radioparticulates of the uranium decay chain will be released over time by wind action on the stored material.
- **Hanks Draw and South Spoils**: Releases of uranium decay chain radioparticulates and radon from stored waste rock or spoils areas.
- **Sheep I and II underground mine adits**: Radon will be released from the adits of the underground mine.
- **Handling of materials**. During handling and transport of materials, both radioparticulates and radon will be released.

Each of the sources were modeled to estimate impacts at receptors of interest. Modeling assumptions and results are presented below.

4.0 MODELING

The computer code MILDOS-AREA was used to estimate potential radiation doses from releases as mentioned above. MILDOS (ANL, 1989) was originally developed to estimate doses from conventional uranium milling operations, including large area releases such as ore storage pads and tailings beaches. Inputs to the dose are limited to uranium decay chain radionuclides. MILDOS was subsequently updated in 1998 to address potential impacts of uranium *in situ* leaching operations (ANL, 1998). In situ leach specific types of source terms, such as production wells and restoration wells are included in the updated version. Modeling parameters and assumptions are addressed below.

MILDOS calculates effective dose as well as organ doses from inhalation, ingestion, direct exposure from deposition of radioparticulates on ground surfaces, and submersion in contaminated air. For each source, there are calculations both with and without radon to allow comparison to 10 CFR 20.1301 (including radon) and 40 CFR 190 (doses excluding radon) dose limits.

Meteorology

Meteorological conditions greatly influence dispersion of radionuclides from estimated releases during the year. The Sheep Mountain Project has an on-site meteorological station. Data for the period August 2010 through September 2013 were used (Table 1 and Figure 1). The data set included wind speed, wind direction, and stability class. These data were converted to stability array joint frequency distribution (STAR file) required for input to MILDOS. These calculations were performed using the STARMD program which is based on the Sigma-Theta method in EPA 454/R-99-005 (EPA, 1987). STAR data represent percentages of time for each wind direction (16 compass points) in particular wind speed and stability classes. As shown in Table 1, winds are from the southeast, south-southeast and south account for nearly 60 percent of the time.

Table 1 - Wind Direction Frequency Distribution

Direction From	Percentage of Total Hours	Direction From	Percentage of Total Hours
N	6.30	S	10.93
NNE	2.58	SSW	5.91
NE	1.98	SW	4.59
ENE	1.58	WSW	3.80
E	0.89	W	3.35
ESE	1.27	WNW	1.28
SE	19.48	NW	2.20
SSE	28.66	NNW	5.19
Total……….100.00			

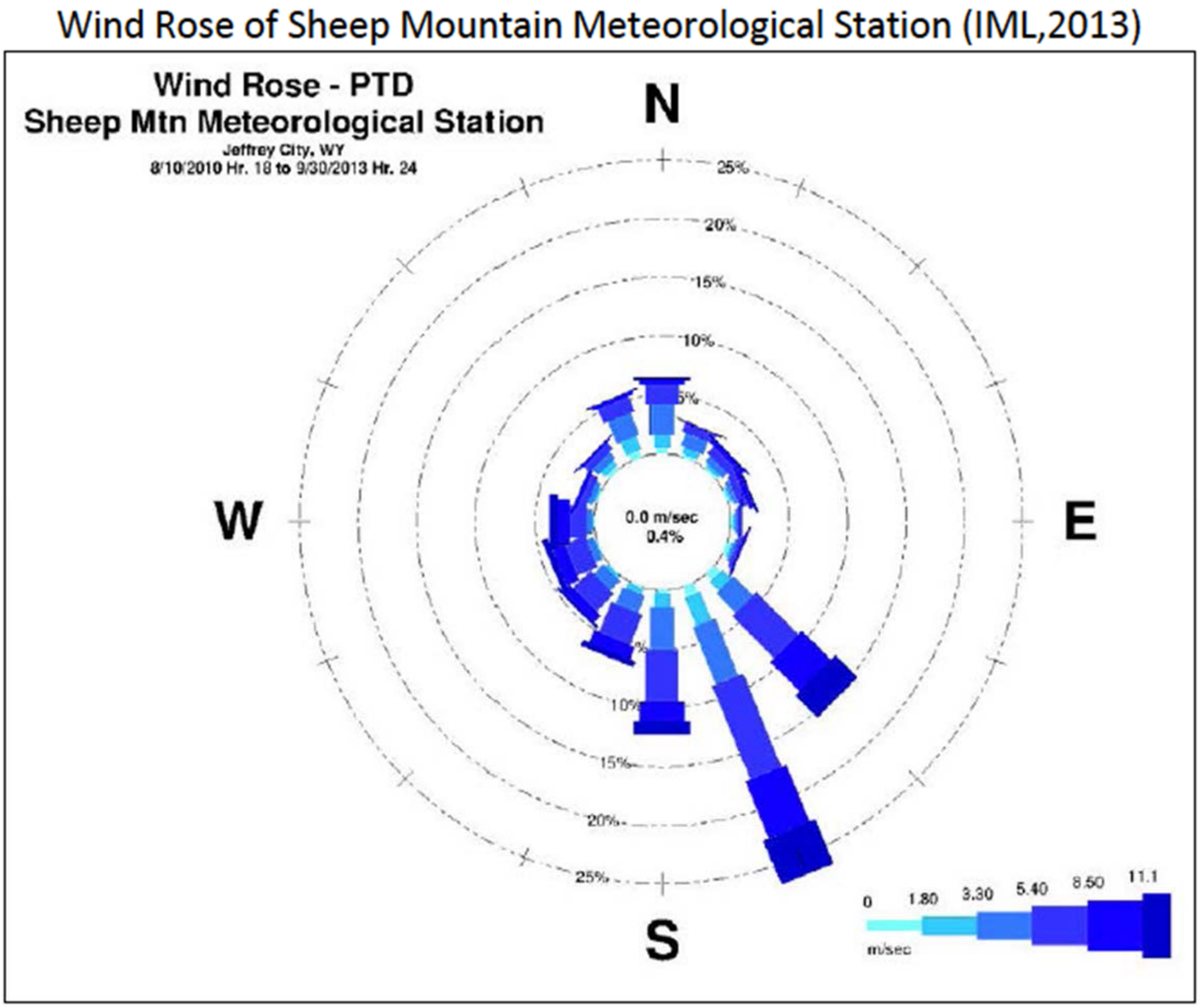


Figure 1. Windrose for Sheep Mountain Meteorological Station

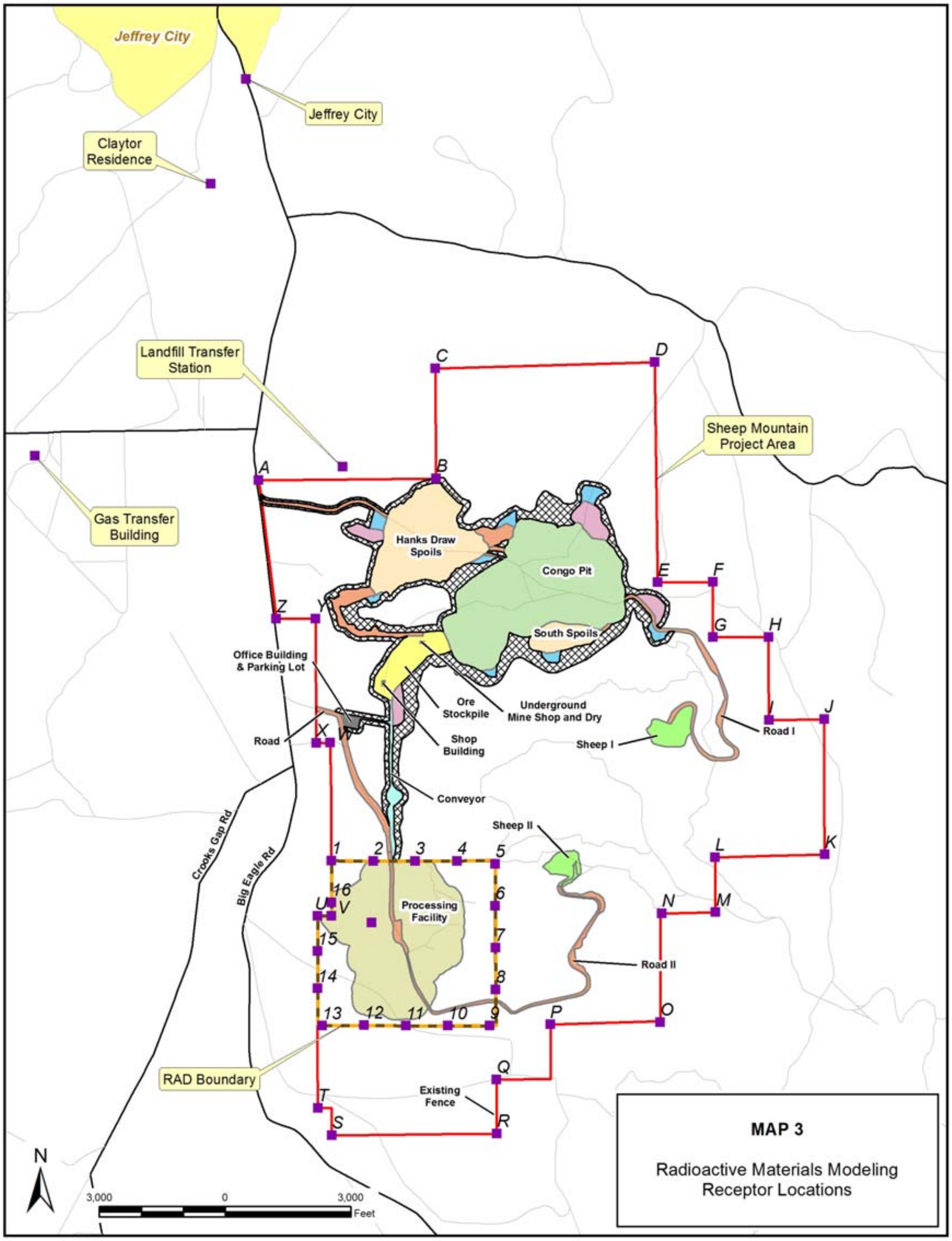
Receptor Locations

For MILDOS purposes, receptors are situated relative to a central location. The locations of receptors are shown on Map 3.

There are few permanent receptors in the vicinity of the Sheep Mountain project. The nearest permanent residence, the Claytor ranch, is 5.5 km to the north-northwest of the plant. The nearest town is Jeffrey City, which is approximately 6 km to the northwest of the proposed central processing facility.

Table 2 - Location of Modeled Receptors (Relative to the Ore Processing Facility)

Name	X (km)	Y (km)	Z (m)	Name	X (km)	Y (km)	Z (m)
Project Area Boundary Receptor Locations							
A	-0.85	3.22	-72	N	2.17	0.14	277
B	0.44	3.26	85	O	2.18	-0.65	175
C	0.41	4.06	141	P	1.38	-0.69	112
D	2.01	4.15	-4	Q	0.99	-1.10	40
E	2.07	2.55	77	R	1.01	-1.50	10
F	2.48	2.56	62	S	-0.19	-1.54	23
G	2.49	2.16	88	T	-0.30	-1.35	-18
H	2.89	2.17	53	U	-0.34	0.05	-33
I	2.91	1.57	111	V	-0.24	0.05	-27
J	3.31	1.58	84	W	-0.28	1.32	-44
K	3.34	0.60	171	X	-0.38	1.31	-50
L	2.54	0.56	207	Y	-0.41	2.22	-18
M	2.56	0.16	297	Z	-0.70	2.21	-58
NRC Boundary Receptor Locations							
1	-0.25	0.46	-36	9	0.94	-0.71	70
2	0.06	0.46	-18	10	0.63	-0.72	47
3	0.36	0.47	0	11	0.33	-0.73	-51
4	0.67	0.48	36	12	0.02	-0.73	-6
5	0.94	0.46	149	13	-0.28	-0.75	-12
6	0.95	0.16	71	14	-0.32	-0.48	-7
7	0.96	-0.15	106	15	-0.33	-0.20	-18
8	0.97	-0.45	76	16	-0.24	0.15	-30
Inhabited Receptor Locations							
Claytor Ranch	1.26	5.36	-111	Landfill Transfer station	-0.24	3.33	-41
Gas Transfer building	2.49	3.35	-61	Jeffrey City	1.02	6.13	-114


Jeffrey City
Jeffrey City
Claytor Residence
Landfill Transfer Station
Gas Transfer Building
Sheep Mountain Project Area
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z
Hanks Draw Spoils
Congo Pit
South Spoils
Office Building & Parking Lot
Road
Ore Stockpile
Underground Mine Shop and Dry
Shop Building
Conveyor
Sheep I
Road I
Sheep II
Road II
Processing Facility
RAD Boundary
Existing Fence
Crooks Gap Rd
Big Eagle Rd
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
N
3,000
0
3,000
Feet
MAP 3
Radioactive Materials Modeling Receptor Locations

Input Parameters for MILDOS Model

Parameters that apply to the entire Project are shown in Table 3.

Table 3 - Important Input Parameters

All sources	Ore grade	0.122% (342 pCi/g U)
	General emanation rate (after Leach et al. 1982)	2160 pCi/ m^2 sec per % ore
	Particle release rate	6.62E-06 g/m^2 sec
Ore stockpile	Area	30.5 ac (1.23E+05 m^2)
	U decay chain concentration	342 pCi/g
	Particulate release rate	6.62E-06 g/m^2 sec
	Enrichment factor, N	2.5
Spoils piles	U decay chain concentration	40 pCi/g
	Area (Hanks Draw + South spoils)	124 ac (5.00E+05 m^2)
	Enrichment factor, N	2.5
Congo Pit	Area	216 ac (8.75E+05 m^2)
	Radon emanation rate	264 pCi / m^2 sec
Sheep I and II adits	Radon release (after Mudd, 2008)	1190 pCi/y
Handling	Particulate releases - Truck dumping	1.88 ton/yr
	Particulate releases - Crusher	0.33 ton/yr
	Particulate releases - Conveyor	2.41 ton/yr
	Radon emission factor	0.1

The particulate release rate was taken from the stockpiles values presented in Table 1 of the Air Quality Technical Support Document (AQTSD) and converted to the size of the ore stockpile. This value was used to calculate the releases from storage of materials. The activity enrichment factor, N, is set at 2.5 to reflect the extent to which suspended airborne particles have a higher uranium concentration than in bulk ore (NRC, 1987, page 3.59-8).

For modeling of spoils storage, it was conservatively assumed that the uranium decay chain concentrations of the spoils materials was 40 pCi/g, or approximately 1/8 that of the ore itself.

To model handling of overburden and placement on spoil piles, the values presented in the AQTSD Table 1 were used. Overburden was assumed to have only 5 pCi/g of uranium, while ore has a concentration of 342 pCi/g. For handling of ore via truck dumping, crushing, and transport by conveyor, the particulate release rates from the AQTSD Table 1 were used.

The general emanation rate for radon gas from ore deposits was taken from Leach et al. (1982) who studied a relatively high grade pit mine in Australia. They observed that the ratio of radon emanation rate to ore grade was fairly stable. Unless the ore was weathered, the emanation rate held steady at 80 Bq/m^2 sec per % ore, which is equivalent to 2,160 pCi/ m^2 sec per % ore. For the Sheep Mountain ore, this computes to 264 pCi/ m^2 sec for ore.

Radon releases from the Sheep I and Sheep II adits were derived using data presented by Mudd (2008). Mudd studied radon releases from uranium mining and milling projects in

Australia and cites releases from the Jabiluka and Olympic Dam mines which averaged 121 GBq/day, equivalent to 1190 pCi/yr.

For handling of materials, the radon emission fraction was set as 0.1 because of the relatively short residence time of materials in these processes (NRC 1987, page 3.59-15). The general equation to estimate a radioparticulate release rate for handling of ore is:

$$S = EF * C * E * 9.08E - 07 \text{ Ci/yr}$$

Where:

S	= source term, amount released
EF	= Emissions, tons/yr
C	= Concentration, pCI/g
E	= Enrichment ratio, 2.5 unitless

For truck dumping, this accounts for 1.46E-3 Ci released per year from the ore pad dumping point source. The enrichment factor of 2.5 accounts for the fact radionuclide concentrations in suspended airborne materials is considerably higher than in bulk ore.

Radon releases from crushing ore are calculated using:

$$S = EF * C * 0.1 * 9.08E - 07\frac{Ci}{yr}$$

Where:

S	= amount of Rn released
EF	= Emissions, tons/yr
C	= Concentration, pCI/g
0.1	= fraction of radon in ore released during crushing

For crushing, this amounts to 22.9 Ci/yr of Rn released as a point source.

Modeling

MILDOS allows a variety of types of source terms, including:

- Point sources: used for releases from stacks, material handling, and various stationary sources.
- Area sources: used for sources such as ore pads or tailings beaches. Implicitly assumes a square footprint.
- Quadrilateral area sources: allow modeling of sources such as ore pads and tailings beaches having a non-square footprint.
- New well field sources: models radon release from installation of new wells at an *in situ* recovery (ISR) site.
- Production well field sources: models releases of radon from venting or purge water releases from wells, piping, or ion exchange columns during uranium production at an ISR site.

- Drying and packaging sources: allows for modeling of releases of radioparticulates from non-vacuum dryers.
- Restoration well field sources: m models releases of radon from venting or purge water releases from wells, piping, or ion exchange columns during restoration of a wellfield at an ISR site.

For purposes of this modeling exercise, sources were considered to be either point sources or quadrilateral sources. The model was run for each of the following situations for a time step of one year:

- **Ore stockpile:** The ore stockpile was modeled as a quadrilateral source that mimics the size and location shown on Map 2.
- **Spoils pile:** The Hanks Draw spoils pile was modeled as two quadrilaterals shaped to mimic the single pile shown on Map 2. The South Spoils pile was modeled as a single quadrilateral.
- **Congo Pit:** Radon releases from the Congo Pit were modeled as a three quadrilateral sources that collectively overlay the proposed pit. Radon emanation was conservatively calculated assuming that the entire shape was composed of ore, with the general emanation rate shown in Table 4.
- **Sheep I and Sheep II adits:** Releases from the adits were calculated using the release rates presented by Mudd (2008).
- **Handling:** As mentioned above, handling of materials used the particulate and radon release rates described above for each source, considered to be a point. Releases were assumed to occur at the centroid of the source with the exception of the conveyor. The total conveyor releases for both radioparticulates and radon were modeled as six separate sources stretching from the ore stockpile/crusher to the NRC boundary.

Inhalation, direct exposure from material deposited on the surface (ground) and submersion in contaminated air (cloud) were calculated for all receptors. Food pathways were included for vegetables and cattle grown in the area. It was assumed that all cattle feed was from pasture grass, not hay or other feed. The milk pathway was turned off for all receptors because there is no commercial dairy in the vicinity. Doses were calculated for an 8,760-hr year, a conservative assumption meaning that, unless otherwise noted, exposure at a receptor location occurs for 100 percent of the time.

5.0 MODEL RESULTS

This section presents the results of the MILDOS modeling.

Radon Release Rates

Potential annual radon release rates calculated by MILDOS from input parameters during the Project from the various sources are listed in Table 4. The activity of ^{238}U decay products is equivalent to the ^{238}U activity because they are considered to be in secular equilibrium with the parent radionuclide.

Table 4 - Calculated Radioactivity Releases by Source

	Source	Ci/yr
Activity	**Radioparticulates (^{238}U and decay products in equilibrium)**	
Storage	Ore stockpile	2.23E-02
	Hanks Draw spoils	7.50E-03
	South spoils	7.70E-04
Handling	Overburden unloading	8.14E-05
	Truck dumping	1.46E-03
	Crusher	2.56E-04
	Conveyor	1.87E-03
	Radon	
Storage	Ore stockpile	1.04E+03
	Hanks Draw spoils	3.45E+02
	South spoils	3.53E+01
	Congo Pit	6.03E+03
	Sheep I and II adits	1.19E+03
Handling	Overburden unloading	7.10E-00
	Truck dumping	2.29E+01
	Crusher	2.29E+01
	Conveyor	4.68E+01

Dose to Individual Receptor Locations

Estimated maximum annual total effective dose equivalents (TEDE) and 40 CFR 190 doses (without radon) at individual boundary receptor locations are shown below in Tables 5 and 6. The maximum TEDE to any Project Area boundary location occurs at location B and is estimated at 19.7 mrem, which is far below that 100 mrem/yr limit expressed in 10 CFR 20.1301. At the same location, the bone dose exceeds the 25 mrem/yr limit of 40 CFR 190 for any organ. The dose strictly from radon and radon decay products at location B is the difference between the TEDE (dose including particulates and radon) and the 40 CFR 190 effective dose (dose without radon) or 17.3 mrem/yr. Location B is very near to the Hanks Draw spoils pile, so it makes sense that it would be the highest dose location.

Table 4
Total Effective Dose Equivalent (TEDE) and 40 CFR 190 Doses (without radon) to an Adult at Sheep Mountain Project Area Boundary Locations

Location	TEDE (mrem/yr)	40 CFR 190 Dose (mrem/yr)		
		Eff	Bone	Lung
A	6.47E+00	6.59E-01	7.69E+00	1.86E+00
B	**1.97E+01**	**2.41E+00**	**2.93E+01**	**6.39E+00**
C	1.52E+01	7.28E-01	8.75E+00	1.96E+00
D	3.25E+00	1.19E-01	1.41E+00	3.30E-01
E	3.60E+00	1.45E-01	1.71E+00	4.03E-01
F	2.38E+00	1.01E-01	1.19E+00	2.82E-01
G	2.33E+00	8.78E-02	1.03E+00	2.49E-01
H	1.62E+00	6.76E-02	7.90E-01	1.92E-01
I	1.62E+00	4.67E-02	5.38E-01	1.35E-01
J	1.14E+00	3.73E-02	4.29E-01	1.08E-01
K	1.86E+00	1.99E-02	2.24E-01	5.94E-02
L	6.20E+00	3.74E-02	4.28E-01	1.09E-01
M	4.81E+00	3.52E-02	4.02E-01	1.03E-01
N	6.06E+00	5.20E-02	5.92E-01	1.51E-01
O	4.03E+00	4.24E-02	4.76E-01	1.26E-01
P	3.19E+00	7.17E-02	7.93E-01	2.19E-01
Q	2.52E+00	6.68E-02	7.33E-01	2.08E-01
R	2.20E+00	5.43E-02	5.94E-01	1.69E-01
S	1.44E+00	4.76E-02	5.16E-01	1.51E-01
T	1.41E+00	5.30E-02	5.65E-01	1.72E-01
U	2.03E+00	1.09E-01	1.18E+00	3.51E-01
V	2.22E+00	1.29E-01	1.37E+00	4.23E-01
W	4.63E+00	3.83E-01	4.45E+00	1.07E+00
X	3.80E+00	2.83E-01	3.30E+00	7.96E-01
Y	1.27E+01	2.03E+00	2.31E+01	6.02E+00
Z	4.80E+00	4.83E-01	5.56E+00	1.40E+00

Doses at the so-called NRC Restricted Area boundary are shown in Table 6. The maximum TEDE for any NRC boundary location is 12.9 mrem/yr at NRC5. The maximum organ dose occurs in the bone of an adult at the NRC3 location. Both the TEDE and organ doses are below the public dose limits of 100 mrem/yr and 25 mrem/yr dose limits from 10 CFR 20.1301 and 40 CFR 190, respectively.

Table 7 lists doses to locations actually inhabited or utilized. The Gas Transfer building has the highest estimated TEDE of 19.8 mrem/yr. The Claytor Ranch location would be subject to 7.76 mrem/yr and Jeffrey City 6.99 mrem/yr TEDE. No 40CFR190 dose exceeds the 25 mrem/yr limit.

It is important to note that the calculated doses are conservative (overestimates) for several reasons. The primary reason is that MILDOS assumes 100 percent occupancy at the modeled location. That means to receive 19.7 mrem, as modeled for location B, a person would be required to be at that location for 8,760 hours during the year. This is a very unlikely scenario. Likewise, a worker at the Gas Transfer building who spent 40 hours/week or 2,000 hours per year would receive 19.8*2000/8760 hours/year or 4.5 mrem/yr. In reality, workers are at the gas transfer building only sporadically and for far less than 40 hours/week.

Table 5
Total Effective Dose Equivalent (TEDE) and 40 CFR 190 (without radon) dose to Adult at NRC Boundary Locations

Name	TEDE (mrem/yr)	40 CFR 190 Dose (mrem/yr)		
		Effective	Bone	Lung
NRC1	3.82E+00	1.77E-01	1.98E+00	5.14E-01
NRC2	6.01E+00	4.94E-01	5.29E+00	1.48E+00
NRC3	8.43E+00	**6.41E-01**	**6.79E+00**	**1.94E+00**
NRC4	9.69E+00	2.95E-01	3.28E+00	8.64E-01
NRC5	**1.29E+01**	2.06E-01	2.32E+00	5.99E-01
NRC6	1.07E+01	1.65E-01	1.86E+00	4.79E-01
NRC7	8.15E+00	1.40E-01	1.56E+00	4.07E-01
NRC8	6.53E+00	1.18E-01	1.31E+00	3.46E-01
NRC9	5.41E+00	1.03E-01	1.14E+00	3.02E-01
NRC10	1.82E+00	2.92E-02	3.32E-01	8.39E-02
NRC11	3.32E+00	1.22E-01	1.35E+00	3.58E-01
NRC12	3.33E+00	1.10E-01	1.21E+00	3.26E-01
NRC13	2.71E+00	9.02E-02	9.87E-01	2.68E-01
NRC14	2.93E+00	9.15E-02	1.01E+00	2.70E-01
NRC15	3.11E+00	1.27E-01	1.39E+00	3.78E-01
NRC16	3.54E+00	1.68E-01	1.83E+00	4.93E-01

Table 6
Total Effective Dose Equivalent (TEDE) and Dose without Radon (40 CFR 190) to Adult at Each Inhabited Location

Name	TEDE (mrem/yr)	40 CFR 190 Dose (mrem/yr)		
		Effective	Bone	Lung
Claytor Ranch	7.76E+00	3.19E-01	3.74E+00	8.77E-01
Landfill Transfer	2.15E+00	7.75E-02	8.59E-01	2.26E-01
Gas Transfer	1.98E+01	1.41E+00	1.67E+01	3.86E+00
Jeffrey City	6.99E+00	2.37E-01	2.77E+00	6.54E-01

Dose to Members of the Public Under Various Scenarios

The above doses are to locations and represent a maximum potential dose due to the 100 percent occupancy assumption. In reality, various members of the public may potentially be exposed under a variety of different situations. Several common exposure scenarios include a courier or delivery person, a worker at the landfill transfer station, a visitor at the mine site, and a person camping nearby. Potential doses to each of these scenarios were calculated and the results are shown in Table 8.

Table 7
Potential Classes of Exposure to Members of the Public

Class	Annual Hours Exposed	MILDOS Dose Rate (modeled location)	Estimated Annual Dose
Delivery person	2.5 hr/wk * 50 wks/yr = 125 hr/yr	4.63 mrem/yr (location W)	(125 hr/yr * 4.63 mrem/yr) / 8760 hr/yr = 6.6E-02 mrem/yr
Tour group	8 hr/yr	12.2 mrem/yr (average of locations B & W)	(8 hr/yr * 12.2 mrem/yr) / 8760 hr/yr = 1.1E-02 mrem/yr
Landfill worker	8 hr/wk * 50 wk/yr = 400 hr/yr	2.15 mrem/yr (landfill transfer station)	(400 hr/yr * 2.15 mrem/yr) / 8760 hr/yr = 9.8E-02 mrem/yr
Camper	1 wk/yr = 168 hr/yr	19.7 mrem/yr (Location B)	(168 hr/yr * 19.7 mrem/yr) / 8760 hr/yr = 3.8E-01 mrem/yr

Delivery Person or Courier

It is reasonable to assume that a courier or delivery person might spend as much as 125 hours per year at the Project office building (Map 2). The nearest modeled dose location to that building is location W (Map 4) which has an estimated dose rate of 4.63 mrem/yr. Prorating that rate for the 125 hour exposure equates to an annual dose of 6.6E-02 mrem.

Tour Group Member

Tours of the Project would likely spend some time being briefed at the office building (Map 2) and then be transported to various locations around the Project Area. A likely maximum exposure time of 8 hours seems reasonable. To account for various dose rates at multiple locations, the average of the highest dose rate location and the location nearest the office building was used. The projected tour group member might receive as much as 1.1E-02 mrem during a visit.

Landfill Worker

The landfill transfer station is not occupied by a full-time worker. A worker at that location one day per week would be exposed for 400 hours/year. At the modeled dose rate of 2.1 mrem/yr the annual dose equates to 9.8E-02 mrem.

Camper

It is conceivable, though not likely, that someone might decide to camp near the Project. To be conservative, assume that the campsite is situated near location B, just adjacent to the Hanks Draw Spoils Pile. A camper spending an entire week, 168 hours, at that location would be subjected to a dose rate of 19.7 mrem/yr, which would prorate to 3.8E-01 mrem for the week.

Dose from Mine Adits

As mentioned above, radon releases from the underground mine are from the Sheep I and Sheep II adits. These releases were modeled as point sources with the following results. The maximum dose from the mine adits alone are to location 1 on the NRC Restricted Area boundary and location L on the Project Area boundary (Map 4). Those doses are 5.58 mrem/yr and 3.80 mrem/yr, respectively.

The 40 CFR 61.22 limits dose to a member of the public from an underground mine to 10 mrem/yr. Both these locations are well below that standard.

Contribution from Processing Facility

As shown on Map 2, Energy Fuels intends to operate a heap leach processing facility to the south of the mine complex. A license application will be submitted to the NRC. As part of the application, potential doses from the heap leach facility (mill) were modeled using MILDOS. That facility will also potentially contribute dose to members of the public. Table 9 provides modeled doses to common locations.

Table 8
Modeled TEDE Doses from Mining and Processing

Name	TEDE (mrem/yr)		
	Mine	Mill	Total
Claytor ranch	7.76E+00	9.27E-01	8.69E+00
Landfill Transfer	2.15E+00	7.15E-01	2.87E+00
Jeffrey City	6.99E+00	1.69E-01	7.16E+00
Maximum NRC – mine max (NRC5/NLA-NE)	1.29E+01	2.23E+00	1.51E+01
Maximum NRC - processing max (NRC3/NLA-N1)	8.43E+01	1.8E+01	2.64E+01

The Claytor Ranch location was estimated to received a total of approximately 8.7 mrem/yr from the combined mine and mill operations. The majority of that would result from mining operations which is reasonable given the proximity of the mine compared to the mill. The same is true of Jeffrey City, which would receive a total of 7.2 mrem/yr. Common boundary locations modeled for the mine and the mill are also shown. The maximum dose rate location mining, which was in common with the mill is location NRC5, designated NLA-NE for the mill modeling project. For that location the maximum dose rate was 12.9 mrem/yr, most of which likely results from the Sheep II underground mine adit. Contributions from the mill accounted for 2.23 mrem/yr. The maximum dose rate location modeled for the mill facility is the NRC3 location, designated NLA-N1 in the mill modeling project. The total dose rate at that location is estimated to be 26.4 mrem/yr, nearly 70 percent of which results from the milling process, not mining activities.

Uncertainties in Dose Estimates

MILDOS is not designed to calculate uncertainty associated with estimates of doses. Use of the Gaussian Plume Dispersion coefficients and the uncertainty in the dose conversion factors themselves introduce an unknown amount of uncertainty into estimated doses at receptor locations.

Doses calculated by the code represent an entire year of occupancy at the specified receptor location. For any actual resident, this represents a large overestimate of the actual dose that would be received. Residents in the vicinity would leave their place of residence for work or recreation and the model does not account for those absences. To account for those absences, which would reduce the estimated potential dose, a separate dose assessment using MILDOS-calculated values and prorating for time away from the modeled location would be required. This approach is similar to the scenario approach used above to estimate dose to an individual member of the public.

In addition, conservative assumptions were made in the modeling exercise. For example, radon releases from the Congo Pit were assumed to come from an area equivalent to the entire footprint of the pit with ore grade material. In reality, radon from ore will only be generated from the uncovered ore in the pit, not the entire footprint at once.

6.0 SUMMARY

The maximum TEDE at a receptor point on the Sheep Mountain Project Area Boundary was less than 20 mrem/yr at location B, which is just adjacent to the Hanks Draw Spoils area. The maximum TEDE at any NRC boundary location is estimated to be 12.9 mrem at location NRC5. Neither of these exceed the 10 CFR 20.1301 limit for dose to a member of the public of 100 mrem/yr. At location B, the maximum bone dose is estimated to be 29.3 mrem/yr, which does exceed the 40 CFR190 bone dose of 25 mrem/yr. It is important to remember that these dose rates are to locations, not actual members of the public and are calculated under the assumption of 100 percent occupancy at that location.

The TEDE dose rate at inhabited locations does not exceed 8 mrem/yr for any of the four modeled locations. The dose excluding radon (as per 40CFR190) does not exceed 4 mrem for any of the four. The same caveats regarding occupancy apply to the inhabited locations.

The maximum estimated TEDE from radon releases from the two underground mine adits, labeled Sheep I and Sheep II on Map 2, was 5.58 mrem/yr to location NRC1. This is below the 40 CFR 61.22 dose limit to a member of the public from an underground mine of 10 mrem/yr.

To get a more accurate assessment of actual potential dose to a member of the public, the length of exposure must be accounted for. Doses were estimated for four different classes of members of the public: courier, tour group, landfill worker, and camper. The estimated dose to each of those classes under certain scenarios was less than 1 mrem/yr in all cases.

In summary, while two static locations exceeded the potential bone dose from particulate releases, the TEDE limit was not exceeded at any location, nor by any member of the public under several exposure scenarios. The calculated doses to static locations is conservative due to the assumption of 100 percent occupancy at each location.

REFERENCES

Argonne National Laboratory (ANL). 1989. MILDOS-AREA: An Enhanced Version of MILDOS for Large-Area Sources, June. ANL/ES-161.

Argonne National Laboratory. 1998. MILDOS-AREA User's Guide (Draft). Environmental Assessment Division, September.

Leach, V.A., K.H. Lokan, and L.J. Martin. 1982. A Study of Radiation Parameters in an Open-Pit Mine., *Health Physics* 43(3): 33-375.

Mudd, G.M. 2008. Radon Releases from Australian Uranium Mining and Milling Projects: assessing the UNSCEAR Approach. *Journal of Environmental Radioactivity 99: 288-315.*

U.S. Environmental Protection Agency (EPA). 1987. On-Site Meteorological Program Guidance for Regulatory Modeling Applications. EPA-450/4-87-013. U.S. EPA, Office of Air and Radiation, Research Triangle Park, NC 27711.

U.S. Nuclear Regulatory Commission. 1987. Methods for Estimating Radioactive and Toxic Airborne Source Terms for Uranium Milling Operations, Regulatory Guide 3.59. Office of Nuclear Regulatory Research. March.